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ABSTRACT

Designed for use in carpentry apprenticeship classes, this workbook contains nine units on carpentry skills in the area of interior finish, lists of recommended and required instructional materials, and nine unit tests. Each instructional unit includes a listing of performance statements and text covering skills addressed in individual performance statements. Topics covered in the units are design, blueprints, and specifications: tools used for interior finish work: finish interior wall coverings: installation of jambs in interior door openings: fitting and hanging interior doors: wood molding used in interior trim: plastics and plastic laminates used as wall coverings: installation of built-in cabinets and closets: and hardware used in interior finish. A multiple-choice test is provided for each unit. (MN)

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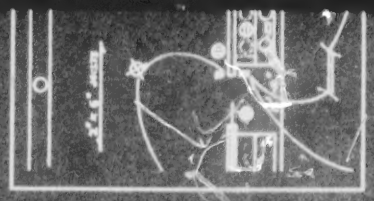
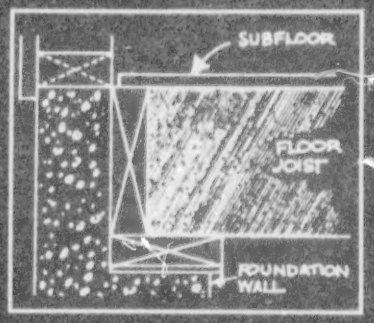
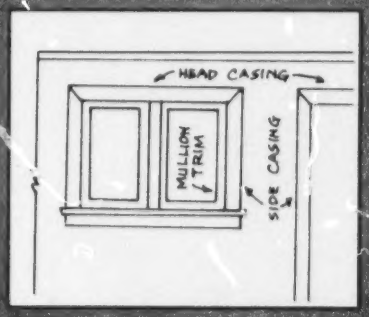
# Course in Carpentry

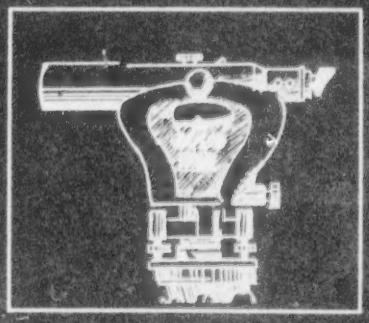
# INTERIOR FINISH

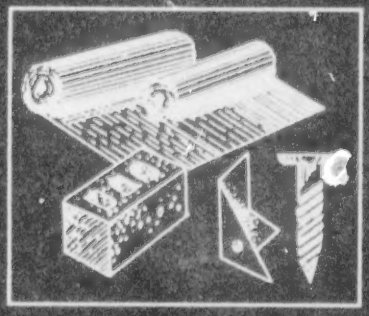
## Workbook and Tests

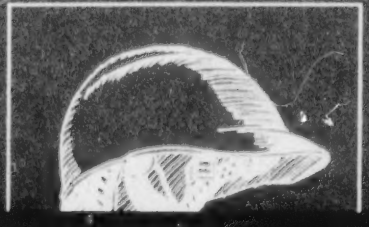








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A column labeled "Date Assigned" has been provided at the right-hand side of each page of the workbook section in the contents. Whenever your instructor assigns a topic, the date should be written in the appropriate blank. When you have completed the topic satisfactorily, your instructor should place his initials next to the assignment date. If this procedure has been followed, and you should transfer from one school to another, you will have an accurate record of the work you have completed. This procedure is intended to ensure that you complete each topic and to ensure that you do not have to duplicate work on topics already studied.

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# Course in Carpentry

# INTERIOR FINISH

Prepared under the direction of the

**Carpenters' Statewide Joint Apprenticeship and Training Committee**
**Carpentry Curriculum Revision Committee**
and the
**California State Department of Education**

2.50

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| | | |
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# Foreword

In the California apprenticeship programs, experience gained on the job is supplemented by classroom work that is closely related to the job. This balanced system of training enables the apprentice to learn the "why" as well as the "how" of the trade. Both types of training are required for advancement in today's competitive industries.

The job-related courses for the skilled trades are highly specialized, and adequate training materials are for the most part not available commercially. To meet this need, the Department of Education, in cooperation with labor and management, develops the required training materials and makes them available to you at cost. This workbook is an example. It was written to provide you with up-to-date information you must have to meet the growing technical demands of the carpentry trade. Every effort has been made to make the workbook clear, comprehensive, and current.

I congratulate you on your choice of carpentry as a career. The effort you put forth today to become a competent journeyman will bring you many rewards and satisfactions, and the benefits will extend also to your community. We need your skills and knowledge.

I wish you every success in your new venture.

*Superintendent of Public Instruction*

# Preface

The State Department of Education, through the Bureau of Publications, provides for the development of instructional materials for apprentices under provisions of the California Apprentice Labor Standards Act. These materials are developed through the cooperative efforts of the Department and employer-employee groups representing apprenticeable trades.

*Interior Finish*, which was first published in 1976, was planned and prepared under the direction of the Carpenters' Statewide Joint Apprenticeship and Training Committee and the Carpentry Curriculum Revision Committee. Many individuals representing employers and employees contributed to the 1976 publication. Those representing central and northern California included James Brooks, Charles Hanna, Gordon Littman, Charles Royalty, Hans Wachsmuth, Bill Walker, and Jimps Wilcox. Those representing the Los Angeles area included Tom Benson, Creighton Blenkhorn, John Cox, Allen Kocher, and Al Preheim. San Diego representatives were Paul Cecil, Jess Dawson, Robert Moorhouse, and Billy Williams. Material for the original publication was prepared by Leonard Koel, Berkeley. Special thanks are expressed to Gordon Littman of San Francisco for his help in preparing this 1981 edition.

This publication is one of a series of individually bound units of instruction for carpentry apprenticeship classes. It consists of two parts—a workbook and a tests section. A test is provided for each topic in the workbook section, and each test sheet is perforated and arranged so that it can be easily removed from the book at the discretion of the instructor without disturbing any other test. These books reflect the continuing cooperative effort of labor, management, local schools, and the Department of Education to provide the best instructional materials for California apprenticeship classes. They are dedicated to excellence in the training of carpenter apprentices.

THEODORE R. SMITH
*Editor in Chief*
*Bureau of Publications*

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# Acknowledgments

Gratitude is expressed to the listed manufacturers and associations within the construction industry who contributed valuable technical information, drawings, and photographs used in this series of carpentry units.

American Plywood Association
American Technical Society
Duo-Fast Corporation
Formica Corporation
National Forest Products Association
Red Cedar Shingle and Hand Split Shake Bureau
Republic Builders Products Corporation
Rockwell International Corporation, Power Tool Division
Schlage Lock Company
Stanley Tools
TECO Wood Fastenings
United States League of Savings Associations
Von Duprin Incorporated
Western Wood Products Association

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# Interior Finish

## TOPIC 1 – DESIGN, BLUEPRINTS, AND SPECIFICATIONS

This topic is planned to provide answers to the following questions:

- **How does the interior finish relate to the general design of the building?**
- **What sections of the blueprints provide information regarding the interior finish?**
- **What information on interior finish is provided in the specifications?**

A building is most often judged by the quality and design of its surface appearance. All interior finish, which may include wood, metal, or plastic trim members, paneling, doors, cabinets, and hardware, is installed by the carpenter. To do this work, the carpenter must have special skills. The trim carpenter who is skilled in finishing work is very much in demand in the construction industry.

### Building Design and Interior Trim

The interior finish of a well-designed building will be in keeping with the total design of the structure. A post-and-beam house where much of the framework is exposed in the interior of the house will have a finish that is much different than that of a conventionally framed house where the studs are covered by plaster or gypsum wallboard. Interior finish is also influenced by the functions of different areas of the building. In a bathroom or kitchen, for example, the finish must be different from that in a living room.

The designs of buildings have changed radically over the years. Fifty years ago wooden trim was characterized by a great deal of ornate molding. The trend today is to make all trim members as simple in design as possible. The same can be said for doors, cabinets, paneling, and hardware used in contemporary buildings.

### Blueprints and the Interior Finish

Most of the information regarding interior finish can be obtained from the blueprints. Any complete set of drawings will have a room finish schedule, door and window schedules, section views, details, and elevations that give the carpenter a complete picture of how the interior of the building is to be finished.

#### Room Finish, Door, and Window Schedules

Before starting any finish work, the carpenter should study the room finish schedule. An example of such a schedule is shown in Table 1-1. If the work was to begin in the living room, the carpenter would read this schedule to learn the following:

1. The walls will have ¼-inch-thick oak paneling over ½-inch-thick gypsum wallboard.
2. The base will be wood. A detailed drawing is shown elsewhere in the blueprints.

TABLE 1-1

**Typical Room Finish Schedule**

| Room | Walls | Base | Floor | Ceiling | Remarks |
|---|---|---|---|---|---|
| Living room | ¼" oak panels over ½" gypsum board | Wood (See detail.) | ½" oak T & G | ½" gypsum board | Bookcase |
| Kitchen | ½" gypsum board | Wood (See detail.) | Linoleum | ½" gypsum board | Cabinets (paint) |
| Bathroom | Tile 5'0" | Vinyl | Vinyl tile | ½" gypsum board | – |
| Hall | Same as living room | Wood (See detail.) | ½" oak T & G | ½" gypsum board | – |
| Bedrooms | ½" gypsum board | Wood (See detail.) | ½" oak T & G | ½" gypsum board | – |

3. The finish floor will be of ½-inch-thick oak tongue and groove.
4. The ceiling will be ½-inch-thick gypsum wallboard.
5. A built-in bookcase is to be constructed.

The other schedules presented in the blueprints include the required information for all doors and windows in the building. A typical door schedule is shown in Table 1-2. The first line of this schedule would provide the following information:

TABLE 1-2

**Typical Door Schedule**

| Mark | Size | Amount required | Remarks |
|---|---|---|---|
| A | 3'0" x 6'8" x 1¾" | 1 | Exterior Flush |
| B | 2'8" x 6'8" x 1¾" | 7 | 1 sliding 1 metal covered |
| C | 2'6" x 6'8" x 1⅜" | 4 | Flush |
| $C_1$ | 2'6" x 6'8" x 1⅜" | 2 | Louvered |

1. The letter A shows how a certain door is marked on the floor plan.
2. The door is 3 feet wide, 6 feet 8 inches high, and 1¾ inches thick.
3. Only one door of this size and type is required in the house.
4. The door is an exterior door.
5. The design of the door is flush (flat surface).

**Details and Section Views**

Blueprints often include references to details and section views in other parts of the drawing. An example of a detail drawing is shown in Fig. 1-1. If the letters FSD (full size detail) appear next to the drawing, then the molding is the actual size shown.

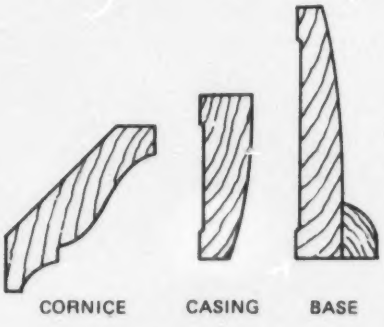



**Fig. 1-1. Detail of typical trim**

The architect may include many section drawings in the blueprints. The drawing in Fig. 1-2 shows the type of casing used to finish the door opening. The jamb (finish door frame) material is

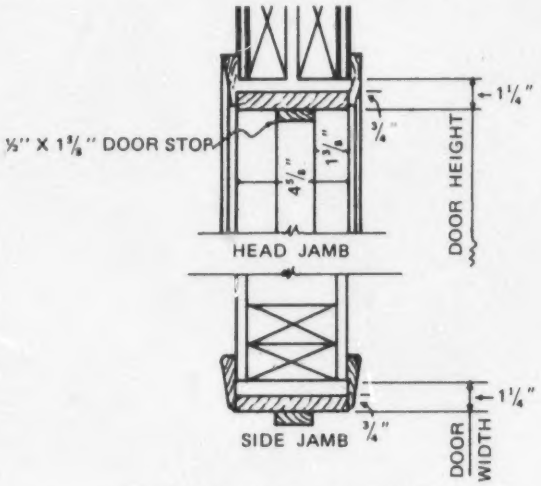



**Fig. 1-2. Interior door frame section**

¾ inch thick and 4⅝ inches wide. The door stops are ½ inch thick and 1⅝ inches wide. The door is 1⅜ inches thick.

Elevation views on the drawings indicate where counters, shelves, and cabinets are to be placed. A typical elevation drawing for a kitchen is shown in Fig. 1-3.

## Specifications

Much of the information that pertains to the interior trim is found in the written specifications. This document supplements and clarifies much of the data found in the blueprint drawings. The specifications are divided into sections such as

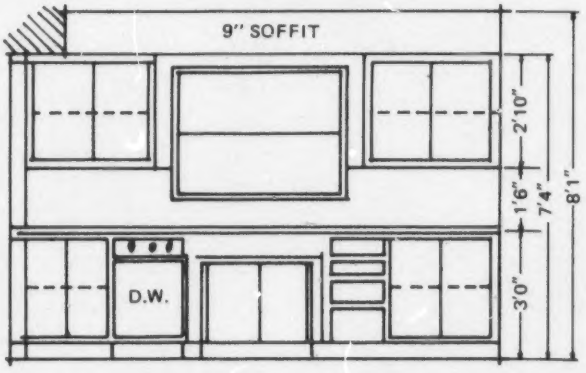



**Fig. 1-3. Kitchen elevations showing cabinet details**

**Millwork: Doors.** Exterior doors shall be 1 3/4-inch-thick white pine of design as indicated. Doors 2 feet 8 inches wide or narrower shall be 1 3/8 inches thick. All others shall be 1 3/4 inches thick. Interior doors shall be flush hollow core doors of birch. All bedroom closet doors shall be louvered. Refer to schedule on drawings for sizes.

**Trim.** Window aprons, base, door casings, cornices, and picture molding shall be first-quality pine. Window stools shall be 1 1/8-inch-thick birch. Base shall be 4-inch member stock design. Door casing stock shall be 2 3/4 inches wide.

**Windows.** Frames and sash shall be for lights as shown on plans. Sash shall be 1 3/4 inches thick and made of kiln-dried white pine or cypress. All shall be mortised, tenoned, and divided as shown on drawings. Refer to drawings for the various types of windows.

**Kitchen Cabinets and Casework.** Kitchen cabinets and casework shall be constructed of red birch plywood using flush door construction. Shelving shall be 3/4-inch-thick plywood with adjustable shelf standards. Cabinets shall have all accessories including pull-out cutting board, bread and cake compartments, vegetable bin, cutlery drawer, and flour and sugar compartments. Top of kitchen counters and breakfast bar shall be plastic laminate, Formica or equivalent. Colors and pattern shall be selected by the architect.

**Closets.** Closets shall be trimmed with plain casing, and hook strip shall be fastened to closet walls. Each closet, except linen closet, shall be equipped with clothes poles and open and closed ferrules. Each closet shall have two shelves; the linen closet shall have five shelves.

**Access Panel.** Provide and install an access panel in the ceiling where shown on drawings. The casings and door shall match the facing wood.

**Stairs.** Basement stairs shall have 7/8-inch-thick mitered yellow pine risers and 1 5/8-inch-thick treads, well supported on 2 x 12 stringers, 16 inches on centers, all as detailed on drawings. The main stairway shall be housed, properly glued, wedged, and blocked; the risers shall be white pine and the treads shall be oak. This stairway shall have not less than 6 feet 8 inches of continuous clear head room measured vertically from the front edge of the tread to a line parallel to the stair nosing.

**Medicine Cases.** Contractor shall furnish and install chrome-edged mirror, porcelain-lined metal medicine cabinets, as selected by owner. A sum of___shall be allowed for each item.

**Hardware.** A sum of___ shall be allowed for the owner to select finishing hardware; carpenter will install same. All necessary rough hardware will be provided.

**Fig. 1-4. Sample specifications**

general conditions, concrete, masonry, carpentry, and millwork. Items that pertain directly to interior trim might be listed in the specifications under the general heading of "Millwork."

The specifications shown in Fig. 1-4 are only a sampling of the trim requirements that an architect may write for a particular building. The apprentice should understand that most specifications are much more detailed.

### Study Assignment

1. Walter E. Durbahn and Robert E. Putnam, *Fundamentals of Carpentry*, Vol. 1, *Tools, Materials, and Practices* (Fifth edition). Chicago: American Technical Society, 1977. Read the material on working drawings, conventions, and symbols in Appendix E.
2. Walter E. Durbahn and Elmer W. Sundberg, *Fundamentals of Carpentry*, Vol. 2, *Practical Construction* (Fifth edition). Chicago: American Technical Society, 1977. Read the chapter on preparing for the job. Study the plans, details, schedules, and specifications for the house illustrated in the text.
3. *California Contemporary House Plans.* Sacramento: California State Department of Education, 1975. Read the sections on room finish, door and window schedules, and interior elevations, and study the molding details on sheets 13 and 14.

## INTERIOR FINISH

## TOPIC 1 – DESIGN, BLUEPRINTS, AND SPECIFICATIONS

### Study Guide

Determine the correct word for each numbered blank in the sentence, and write it in the corresponding blank at the right.

1. House drawings usually are drawn to a __1__ inch scale. 1. _____

2. Most information regarding the interior finish of the house can be obtained from the __2__ and __3__ . 2. _____ 3. _____

3. The room finish schedule shown in Table 1-1 of this topic indicates that the bedroom walls are covered with __4__ , the base is __5__ , and the finish floor is __6__ . 4. _____ 5. _____ 6. _____

4. Information regarding doors and windows can be found in the door and window __7__ . 7. _____

5. As shown in Table 1-2, door C is __8__ feet __9__ inches wide, __10__ feet __11__ inches high, and __12__ inches thick. 8. _____ 9. _____ 10. _____ 11. _____ 12. _____

6. The clearance between the jamb and the header shown in Fig. 1-2 is __13__ inch(es). 13. _____

7. The type of trim and its location are specified in the __14__ and __15__ views. 14. _____ 15. _____

8. The letters FSD stand for __16__ __17__ __18__ . 16. _____ 17. _____ 18. _____

9. Fine lines that show the extreme limits of a dimension are called __19__ lines. 19. _____

10. Molding and other trim members usually are shown __20__ . 20. _____

11. Architects usually provide a __21__ on the drawings as an aid in reading the symbols. 21. _____

12. A builder usually is required to __22__ his workmanship. 22. _____

13. In the specifications presented in this topic, the thickness of the interior doors is __23__ inch(es). 23. _____

14. The contractor's specifications call for the use of __24__ inch door casing stock. 24. _____

15. The specified thickness of the stair treads is __25__ inch(es). 25. _____

## INTERIOR FINISH

## TOPIC 2 – TOOLS USED FOR INTERIOR FINISH WORK

This topic is planned to provide answers to the following questions:

- **What are the principal hand tools used for interior finish work?**
- **What power tools are used for interior finish work?**

The carpenter who does interior finish work uses many types of hand and power tools. New developments, particularly in the area of power tools, are constantly taking place. The skill of the trim carpenter is dependent on an awareness of what is the right tool for the job as well as an understanding of the proper use of the tool.

In this topic the more important tools related specifically to interior finish work will be described. The methods of using these tools will be covered more thoroughly in other topics.

### Hand Tools

Many handsaws are used in trim work (Fig. 2-1). Each is basically a crosscut saw with small teeth (10 to 14 points to the inch). These saws produce a fine cut and have very little set.

#### Crosscut Saw

The most popular crosscut saw is 26 inches long and has 10 or 11 points to the inch. Some trim carpenters also use a 20-inch-long, 12-point saw for cutting paneling and small molding.

#### Compass Saw

The compass saw is similar to the keyhole saw; however, the keyhole saw has smaller blades. The compass saw is used for cutting curved lines and holes. It is also used for starting or making cuts in tight places where a regular saw will not fit. The compass saw is primarily used for cutting holes in paneling for light switches, electrical plugs, and pipes.

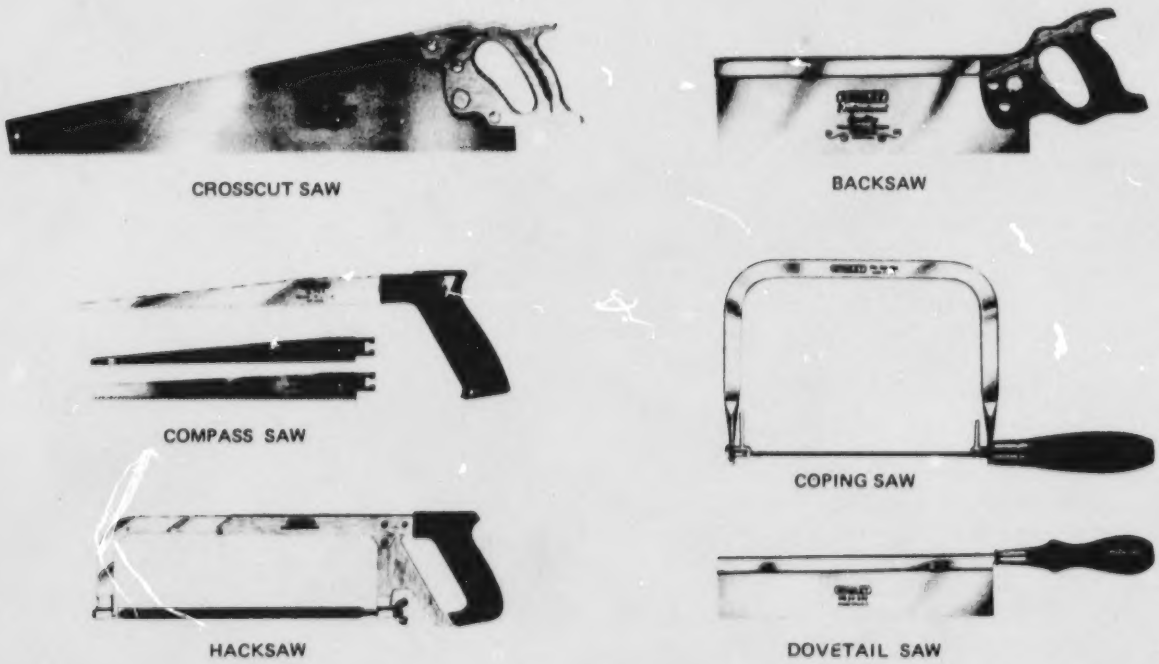



**Fig. 2-1. Saws used for interior trim**

**Coping Saw**

The coping saw is mainly used on molding that has curved or sloping surfaces. Such molding is used at the base and ceiling of a wall. The coping saw also is used to cut curved lines in thin material such as ¼-inch-thick paneling.

**Backsaw**

The backsaw has a thin blade, reinforced with a steel strip on the back edge, with 10 to 14 points per inch. The length of the saw may be from 10 to 26 inches. The shorter backsaws are used for making very fine cuts on molding and other types of trim. The larger types are normally used in steel miter boxes. An altered backsaw is used in laying hardwood floors (Fig. 2-2).

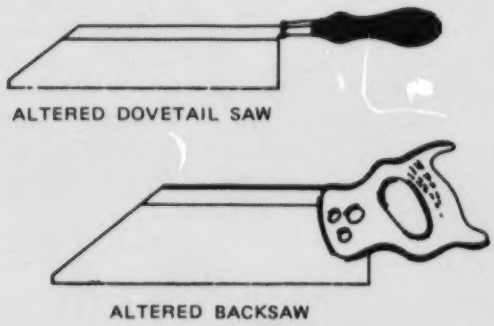



**Fig. 2-2. Special-purpose saws**

**Dovetail Saw**

The dovetail saw, which is a small version of the backsaw, is used for very fine cuts on small moldings. Some carpenters will cut an angle at the end of the saw (Fig. 2-2). They use the altered dovetail saw for starting and cutting holes in paneling.

**Hacksaw**

The hacksaw is used for cutting metal trim.

## Bench Planes

Another important tool used in finish work is the bench plane (Figs. 2-3 and 2-4). Although the different types of bench planes can be used interchangeably for similar operations, each plane is best suited for a particular function.

The plane iron, which does the cutting, is basically a chisel that can be adjusted to take the desired depth of cut (Fig. 2-3). To prevent tearing of the wood surface, the carpenter must take care to move the tool in the same direction as the grain.

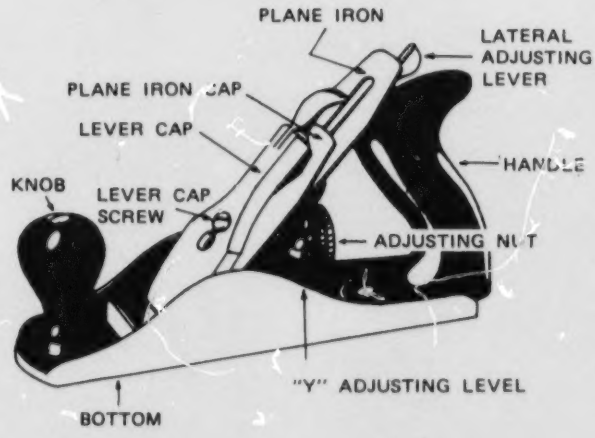



**Fig. 2-3. Smoothing plane**

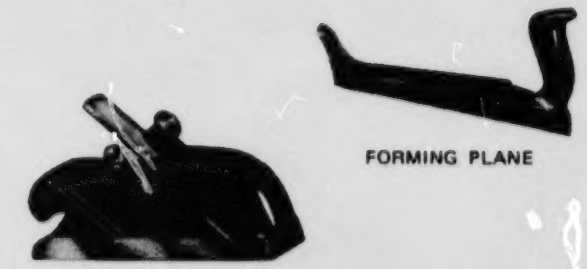



**Fig. 2-4. Bench planes used in interior finish work**

**Block Plane**

The block plane is one of the most useful tools used in trim work. This tool, which is 6 to 7 inches long, is mainly used to plane narrow pieces of wood. Because the blade is set at a lower angle than in other types of planes, this tool is very effective in cutting end grain.

**Smoothing Plane**

The smoothing plane is one size larger than the block plane. The most frequently used smoothing plane is 8 inches long. The blade is 1¾ inches wide. This tool is used to produce a smooth surface, but it is not long enough to effect an even surface. Smoothing planes are used where an already even surface is to be finished.

**Jack Plane**

The jack plane is a good general-purpose plane that can be used for both smoothing and jointing. The type that is most frequently used is 14 inches long and has a 2-inch-wide blade.

**Jointer Plane.**

The jointer plane is the longest (20 to 24 inches) and heaviest of all hand planes used by trim carpenters. It is used for trimming the surfaces of long boards and the edges of doors.

**Fore Plane**

The fore plane is similar to the jointer except that it is shorter (18 inches). It can be used in place of the jointer. Many carpenters prefer the fore plane for fitting doors, because jambs are not always perfectly straight. The shorter length of the fore plane makes it easier to fit the door to the uneven surface of the jamb.

**Duplex Rabbet Plane**

The most popular duplex rabbet plane is 8 inches in length and has a 1½-inch-wide cutter. The plane iron can be placed either in the rear or front seat. An adjustable fence is used for gaging the width of the cut. The rabbet plane is used mostly for making a rabbet joint on the edges or the ends of a board.

**Bull-Nose Rabbet Plane**

The bull-nose rabbet plane is a handy tool for planing into corners.

**Forming Plane**

The forming plane, which has a serrated bottom, is very effective on plywood, end grains, or plastics; however, it leaves a rough surface that has to be finished with another type of plane or with a sander.

## Boring Tools

Although power-driven boring tools are preferred for most hole-drilling operations, the hand boring tools still are used in interior finish work (Fig. 2-5). In operations that require considerable caution, a hand tool might be advisable, because a power-driven tool is much more difficult to control.

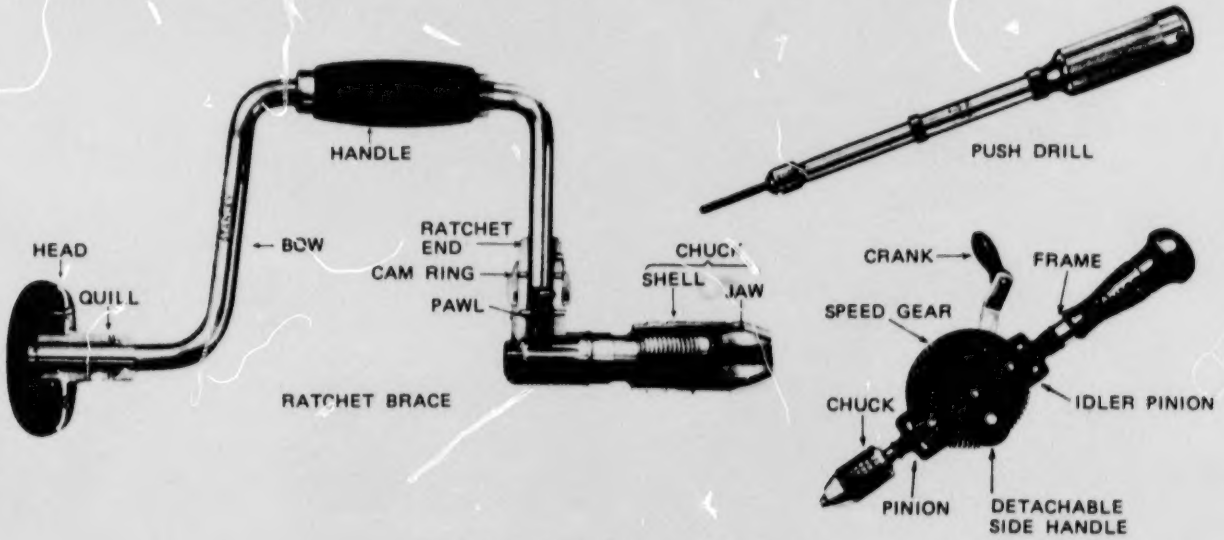



**Fig. 2-5. Boring tools used in trim work**

**Ratchet Brace**

The ratchet brace is the most frequently used hand boring tool. Most carpenters use the brace with a 10-inch sweep. The handle can be turned half circle when the work is close to corners and walls. The brace is measured by its sweep.

**Hand Drill**

The hand drill takes bits up to $\frac{3}{8}$ inch. It is used only when an electric drill is not available.

**Push Drill**

The push drill, which is also referred to as an automatic drill, is convenient for drilling small holes for the application of hardware. The drill rotates as the handle is pushed in. The bits, ranging from $\frac{1}{16}$ to $\frac{11}{64}$ inch, are stored in the handle.

### Ratchet Brace Bits

The ratchet brace has a great variety of bits. They are all characterized by a four-sided tapered tang designed to fit into the jaws of the brace (Fig. 2-6).

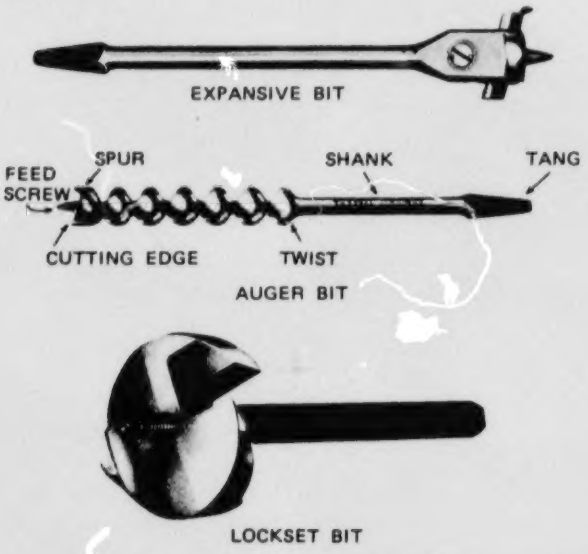



**Fig. 2-6. Bits used with the ratchet brace**

When holes are being drilled, the wood often splits if the bit emerges on the opposite side. To avoid this, the bit should be withdrawn when the feed screw starts to come through. The hole can be finished by drilling back from the opposite side.

**Auger Bit**

A full set of auger bits will cut holes ranging from $\frac{1}{4}$ to $1\frac{1}{2}$ inches in diameter. A number stamped into the square tang indicates the diameter in sixteenths of an inch. The bits are made with coarse-, medium-, or fine-feed screws. The fine-feed screw is recommended for trim work.

**Expansive Bit**

The expansive bit has two adjustable cutters. The smaller cutter will bore holes from $\frac{7}{8}$ to $1\frac{1}{2}$ inches in diameter, while the larger types will cut up to 4 inches in diameter. The advantage of having this tool is that it eliminates carrying many different sizes of large auger bits; however, the cutting action of the expansive bit is not as efficient as that of the auger.

**Lock-Set Bit**

The lock-set bit is designed for drilling the hole for the cylindrical case of cylinder-type locks. The bit is made in special sizes to accommodate the locks of different manufacturers.

**Screwdriver Bit**

Because of the great amount of leverage possible through the use of the ratchet brace, the screwdriver bit is an excellent tool for driving large screws and removing frozen screws in old work.

**Countersink Bit**

The countersink bit is used for countersinking the heads of flat- and oval-head screws.

**Forstner Bit**

The forstner bit is used for drilling holes that do not go all the way through the stock. Unlike the other boring bits, this type has no screw to center it or pull it through the wood.

### Drill Bits

The drill bits shown in Fig. 2-7 can be used in the hand-type or electric drills.

**Fig. 2-7. Bits used with hand and electric drills**

**Twist Drill Bit**

The twist drill bit is used to bore into wood, metal, and other materials. A carbon steel twist drill is adequate for boring into wood; however, a high-speed steel bit is advisable for drilling through hard metals.

**Combination Wood Drill and Countersink Bit**

The combination wood drill and countersink bit is used to drill the pilot hole and countersink the screw head in one operation.

**Automatic Drill Bit**

The automatic drill bit is designed especially for the push drill. It can also be used in hand or power drills.

## Marking and Layout Tools

Marking and layout tools are used in both rough and finish work. Only those tools that are specifically related to finish work will be discussed in this topic (Fig. 2-8).

**Nail Set**

The nail set is used to sink the heads of nails below the surface of the wood. It is also handy for starting and centering holes to be drilled in wood. The tip sizes range from $\frac{1}{32}$ to $\frac{1}{4}$ inch in diameter.

**Center Punch**

The center punch is used for indenting metal surfaces where holes are to be drilled.

**Scriber**

The scriber, which resembles a drafting compass, is used for marking panels or boards against an irregular surface. One leg of the scriber holds an adustable steel point, and the other leg holds a pencil.

**Wing Divider**

The wing divider, which has two pointed steel legs, can be used for scribing purposes where a scratch mark would be easier to see than a pencil line. It is used on plastics and on dark or finished wood. The divider is also used for stepping off stair risers.

**Scratch Awl**

The scratch awl, which is a convenient tool for marking screw holes, can be used to mark lines on plastics and on dark or finished wood.

**Fig. 2-8. Marking and layout tools**

**Utility Knife**

The utility knife is used primarily for marking lines on wood trim prior to mortising for door hinges, mortise locks, and other types of hardware. A knife cut is more definite and finer than a pencil mark.

**Butt Gage**

The butt gage is used to lay out the depth and location of hinges on doors and door jambs. Another butt marker is manufactured in standard sizes for 3-, $3\frac{1}{2}$-, and 4-inch butts. When it is struck with a hammer, three sides of the hinge gain are marked at one time.

**Angle Divider**

The angle divider is a convenient tool for marking the angles of miter cuts other than 45-degree angle cuts. This situation can arise with base and other kinds of wall molding where the inside or outside corners of the wall are not at right angles to each other.

## Miscellaneous Trim Tools

Many of the tools used by the trim carpenter are used throughout the building trade. Some of the more important ones are shown in Fig. 2-9.

**Fig. 2-9. Miscellaneous trim tools**

**Curved Claw Hammer**

The 16-ounce curved claw hammer is the one most frequently used in finish work. Some trim carpenters prefer a 14-ounce hammer. If a wooden handle is used, a small hole can be bored in the end for the storage of paraffin, which is used for waxing screws and nails.

**Lightweight Wood Chisel**

The bevel-edged lightweight wood chisel, with a permanent plastic handle, is best suited for finish work. Chisels come in blade width sizes ranging from ⅛ to 2 inches, with blade lengths varying from 3 to 6 inches. This lightweight chisel is used in mortising out for door hinges, locks, and cabinet hardware.

**Conventional Screwdriver**

The conventional screwdriver is manufactured in different lengths and blade sizes to accommodate the size of the screw itself as well as the slot in the screw head. The carpenter should always use the correct size screwdriver.

**Phillips Screwdriver**

The phillips screwdriver is similar to the conventional screwdriver, but the tip is shaped like a cross to accommodate the slots for phillips-type screws.

**Spiral Ratchet Screwdriver**

The spiral ratchet screwdriver incorporates a spiral groove spindle, which turns as the handle is pushed down. This is the best tool available for driving screws. The bit slips easily into the chuck sleeve, and many bit sizes are available in both conventional and phillips tips.

**Steel Miter Box**

The steel miter box is a precision tool used for guiding a large backsaw in making square and angular cuts. It can be set to cut angles ranging from 45 to 90 degrees. The carpenter can build a wooden miter box, but the cuts become irregular over a short period of time. One advantage of the steel box is its continued accuracy. Another advantage is that it can be adjusted quickly to cut various angles.

**Woodworker's Vise**

The portable woodworker's vise is a handy tool for the trim carpenter. It can be mounted on a bench or on the end of a sawhorse. It can hold

work in a vertical or horizontal position. Doors and other wide boards can be held in the vise while the edges are being planed or hardware is being applied.

### Portable Power Tools

The majority of the power tools used for interior finish work are portable and are operated electrically (Fig. 2-10). The air-powered (pneu-

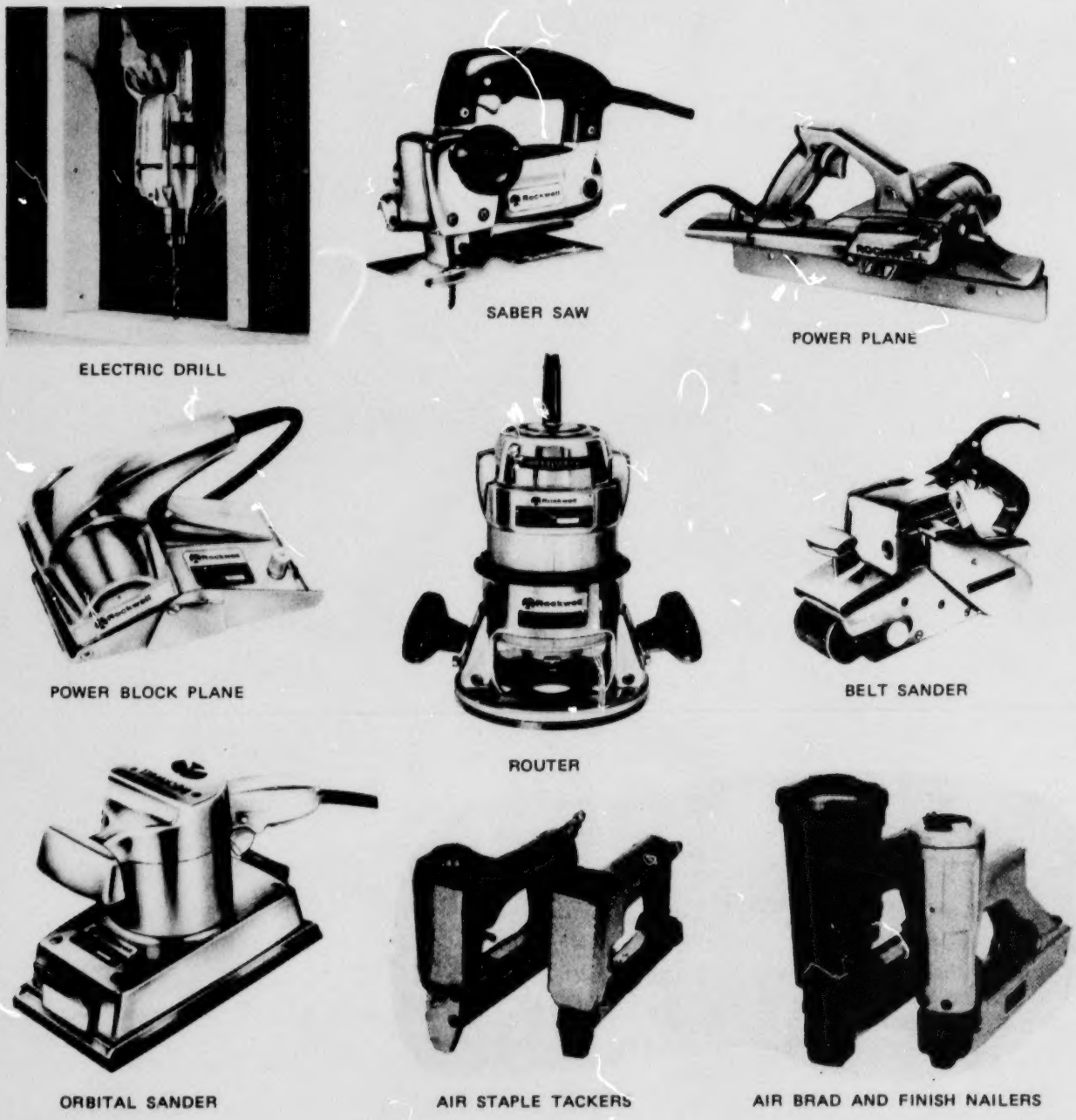



**Fig. 2-10. Portable power tools used in interior finish work**

matic) staplers and nailers are widely used for the application of wood trim. All power tools used by the carpenters on the job should be supplied by the employer.

**Electric Drill**

Electric drills are manufactured in a variety of sizes. The lightweight ¼-inch size is used most often with interior finish work. A heavier ⅜ or ½-inch drill motor is used with the special bits and jigs that are used for boring the holes for cylinder locks.

**Saber Saw**

The saber saw is also referred to as a bayonet saw. It can be used for cutting a straight line, but it is particularly useful for cutting holes, curves, and circles in wood and plastic material.

**Power Plane**

The power plane is equipped with a motor-driven spiral cutter. The depth of the cut can be set from 1/32 to 3/16 inch, and adjustments can be made in the angle of the cut. Carpenters find this tool essential in the planing of doors.

**Power Block Plane**

The power block plane, smaller than the power plane, is used on cabinet doors and small boards. It can be used on wood, plastic, or aluminum.

**Router**

The router is probably one of the most versatile of all power tools. This tool has a wide variety of cutters and accessories, which are used in forming grooves, rabbets, dadoes, and many different kinds of edging designs on boards. The router often is used with a hinge template kit to mortise out doors and jambs for the door butts.

**Belt Sander**

The belt sander is the most popular of the portable sanders. Different grades of belts, ranging from coarse to fine, are used with this tool. It is very effective in sanding large areas and smoothing or rounding edges. When equipped with the proper belt, this sander also can be used on metals and plastics.

**Orbital Sander**

The orbital sander, also known as a "finishing" sander, can be used in space-limited areas; however, it is limited to relatively light finish operations. It is used for sanding cabinets, molding, paneling, and other trim materials.

**Air Staple Tacker**

The air-powered staple tacker can be used to drive staples into wall panels. The heads of the staples are colored to match the panels.

**Brad and Finish Nailer**

The air-powered brad and finish nailer drives fasteners ranging from a ⅝-inch brad to a 2-inch (6d) finishing nail. It can be used on baseboard, casing, or wall panels.

## Stationary Power Tools

Stationary power tools are useful and practical on any construction site where interior finish work is being done. The circular table saw and long bed jointer, which are required by the trim carpenter, can be moved easily from one place to another (Fig. 2-11).

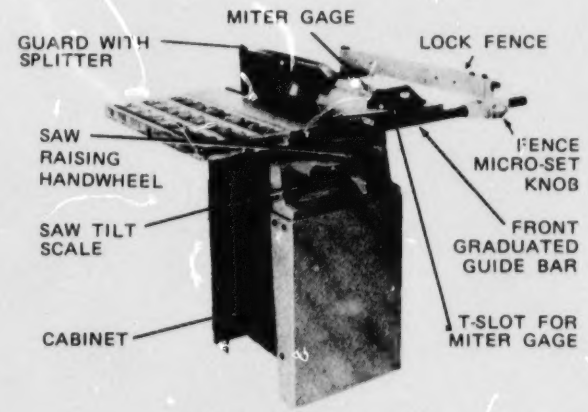



**Fig. 2-11. Stationary power tools used for trim work**

**Circular Table Saw**

The circular table saw is the most efficient tool available for light ripping operations. Ripping and crosscutting can be done at angles from 45 to 90 degrees. A dado head accessory also makes it possible to cut rabbet and dado joints.

**Jointer**

The jointer has a cylindrically shaped cutter head with knives. The jointer most often used on the job has a bed 36 inches long and 6 inches wide. The depth of the cut is adjusted by lowering the front infeed table. The fence can be tilted up to 45 degrees. This tool is used primarily to straighten the edges of boards. Other operations performed on the jointer include beveling, chamfering, and rabbeting.

**Study Assignment**

Durbahn and Putnam, *Fundamentals of Carpentry*, Vol. 1 (Fifth edition). Read the sections related to hand tools and power tools in chapters 3 and 4.

## INTERIOR FINISH

## TOPIC 2 – TOOLS USED FOR INTERIOR FINISH WORK

### Study Guide

Determine the correct word for each numbered blank in the sentence, and write it in the corresponding blank at the right.

1. The most frequently used crosscut handsaw used by trim carpenters is __1__ inches long and has __2__ or __3__ points to the inch. — 1. _____ 2. _____ 3. _____

2. In addition to the handsaw, other saws used in wood trim work would include the __4__, __5__, __6__, and __7__ saws. — 4. _____ 5. _____ 6. _____ 7. _____

3. Bench planes that are most effective for smoothing and jointing boards are the __8__, __9__, and __10__ planes. — 8. _____ 9. _____ 10. _____

4. The ratchet __11__ with a __12__ -inch sweep is the most frequently used hand boring tool. — 11. _____ 12. _____

5. Some of the bits used with the ratchet brace are the __13__, __14__, __15__, __16__, __17__, and __18__ bits. — 13. _____ 14. _____ 15. _____ 16. _____ 17. _____ 18. _____

6. When door butts are being set by hand, a __19__ __20__ is used to mark the outline and a __21__ is used to mortise out the wood. — 19. _____ 20. _____ 21. _____

7. Most portable power tools are operated __22__ and __23__. — 22. _____ 23. _____

8. The __24__ sander and the __25__ sander are the most convenient portable sanders used in trim work. — 24. _____ 25. _____

9. The fitting of doors is frequently done with an electric __26__ plane, and the hinges are mortised with an electric __27__. — 26. _____ 27. _____

10. The two stationary power tools normally used on the job site are the __28__ table saw and the __29__ __30__ jointer. — 28. _____ 29. _____ 30. _____

## INTERIOR FINISH

## TOPIC 3 – FINISH INTERIOR WALL COVERINGS

This topic is planned to provide answers to the following questions:

- **How are walls prepared for panel application?**
- **What are the different wood panel systems?**
- **How are panels attached to the walls?**
- **What other decorative panel materials are used for interior wall covering?**

Wall surfaces can be finished in a variety of ways. Plaster and gypsum wallboard are probably the least expensive surfaces. A more imaginative wall can be constructed with one of the many paneling systems that include vertical and horizontal board systems as well as plywood and hardboard panels. Plastics that simulate wood grain patterns and other designs are being used increasingly for wall finishes.

### Plywood and Veneer Paneling

Wood grain plywood produces a most pleasing wall finish. The plywood panels are usually ¼ inch thick, 4 feet wide, and 8 or 10 feet long. They are usually surfaced with hardwood veneers such as walnut, oak, birch, ash, or mahogany. The panels may have smooth, rough, or brushed surfaces. Some of the more popular paneling has vertical grooves that hide the joint between panels and form attractive shadow lines.

Formerly, plywood and veneer panels were finished by painters after the panels had been applied to the walls. Today, most paneling is prefinished, which means that it has been stained, sealed, and varnished at the fabricating plant. Such prefinished material must be handled and installed with extra care.

Some of the more basic procedures followed by experienced trim carpenters will be described in this topic.

#### Preparing the Walls

Plywood and veneer panels can be applied directly to the wall studs; however, in new construction a layer of ⅜- or ½-inch-thick gypsum wallboard should be nailed to the studs before the panels are applied. This method is recommended because it adds to the strength, insulation, and fire resistance of the wall.

Where panels are installed over uneven surfaces such as plastered or masonry walls, 1-inch by 2-inch furring strips should first be attached to the walls 16 inches on centers (Fig. 3-1). Where

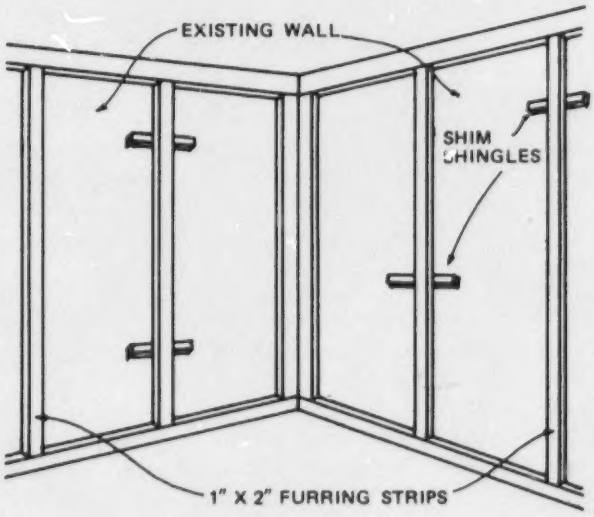



**Fig. 3-1. Furring strips over plastered or masonry walls**

¼-inch panels are used, better backing can be achieved by placing furring strips 16 inches on centers horizontally and vertically. If the walls are uneven, the furring strips can be straightened by the use of shim shingles.

#### Forming the Joints and Corners

Before any paneling can be installed, the carpenter must decide how the panels are to be fitted at the inside and outside corners and at the floor and ceiling.

The simplest corner joints are those in which the joints are covered with a molding (View B in Figs. 3-2 and 3-3). The other joints (views A and C) must be scribed and fitted. A miter joint on the outside corner of a paneled wall is not recommended. A proper fit is very difficult, and the thin surface veneer is easily splintered and damaged.

All paneled walls have some kind of base at the floor (Fig. 3-4). A cove molding is shown at the ceiling in Fig. 3-4. Panels frequently are scribed to the ceiling without the use of a molding. In other

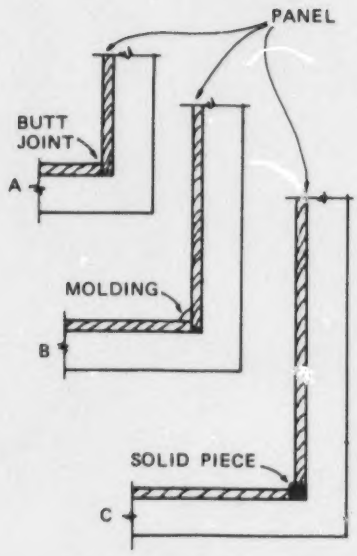



Fig. 3-2. Forming inside corners

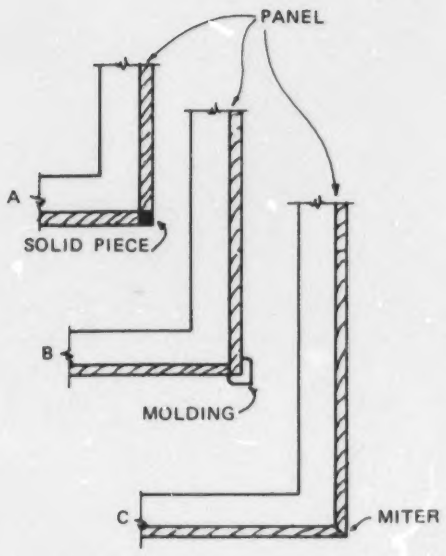



Fig. 3-3. Forming outside corners

cases a decorative molding may be used. The panels may be fitted together using channel or V-joints (Fig. 3-5). To fit the V-joint, the carpenter lightly runs a block plane along the edges of the panels, slightly undercutting to obtain a tight fit. This type of panel joint does not require careful fitting between the two panels because the actual joint is hidden at the bottom of the V.

**Installing the Panels**

The panel installation described in this topic will include butt joints at the inside and outside corners. No molding will be installed at the ceiling. Before any panels are fastened to the walls, they should be arranged along the walls in such a way that the panels with similar grain patterns are next to each other. The carpenter should proceed as follows:

1. Number the panels so they can be stacked and used in the order decided upon.
2. Ensure that the starting panel is set perfectly plumb and that any space between the edge of the panel and the intersecting wall will be covered by the thickness of the panel that will butt up against it.
3. Tack-nail the end panel on the wall in a plumb position. Using a scriber or wing divider, mark the panel (View A in Fig. 3-6). A 10- or 11-point crosscut saw should be used to cut along the scribed line. A good practice is to slant the saw to undercut the edge. When this method is used, the back of the panel will not hold the joint open, and less planing will be required to fit the edges together. The block plane is

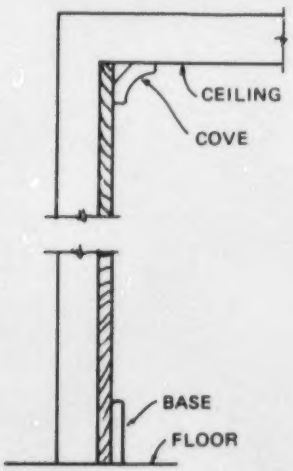



Fig. 3-4. Typical floor and ceiling finishes

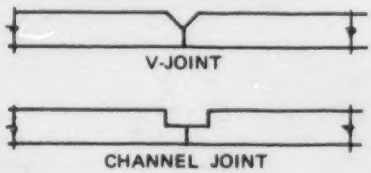



Fig. 3-5. Typical vertical joints between panels

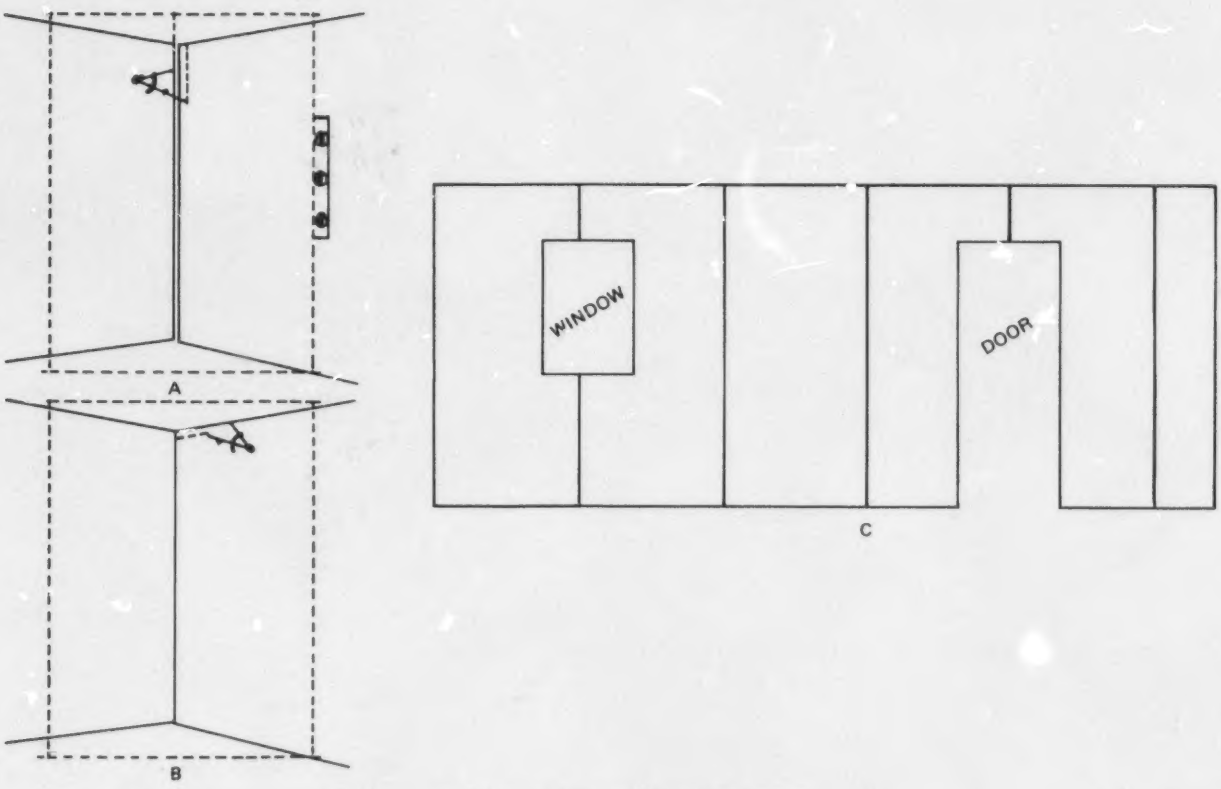



Fig. 3-6. Installing plywood panels

the most convenient tool to use in this operation. It is light, and it can be carried in the pocket of one's overalls or nail apron.

4. Scribe the top of the panel to the ceiling (View B in Fig. 3-6). After the panel is pushed up against the ceiling (a flat bar is very handy for raising a panel), any space left at the bottom of the panel will be covered by the base molding. Proceed to fit the rest of the panels along the wall, cutting out for door and window openings as you come to them (View C in Fig. 3-6).

The correct placement of the last piece of paneling is the most difficult operation in the installation of plywood panels. This piece must be cut to fit on two edges. The recommended procedure is as follows:

1. Cut the piece to be fitted a little wider than the greatest width of the space to be filled. Tip the piece (as shown at Point A in Fig. 3-7), and check to see if any fitting will be required against panel X. Plane where necessary.
2. Measure back 1 inch from the edge at the top and bottom of panel X and mark (Point B in Fig. 3-7).
3. Tack-nail the previously fitted edge to these marks. Set the scriber a little less than an inch (to allow for a tight fit), and scribe (Point C in Fig. 3-7).
4. Cut on the waste side of the mark. A good fit on both edges can be made this way.

The procedure for making the flush outside corner is illustrated in Fig. 3-8. The steps are as follows:

1. Carefully cut the panels on each side of the corner to be flush with the corner stud (View A in Fig. 3-8).
2. Glue an oversized piece of solid stock (same material as plywood face veneer) into the corner, and allow the glue to dry (View B in Fig. 3-8).
3. Plane down the strip being careful to avoid touching the veneer face with the plane. Finish it off with a flat scraper and fine sandpaper for a flush corner (View C in Fig. 3-8).

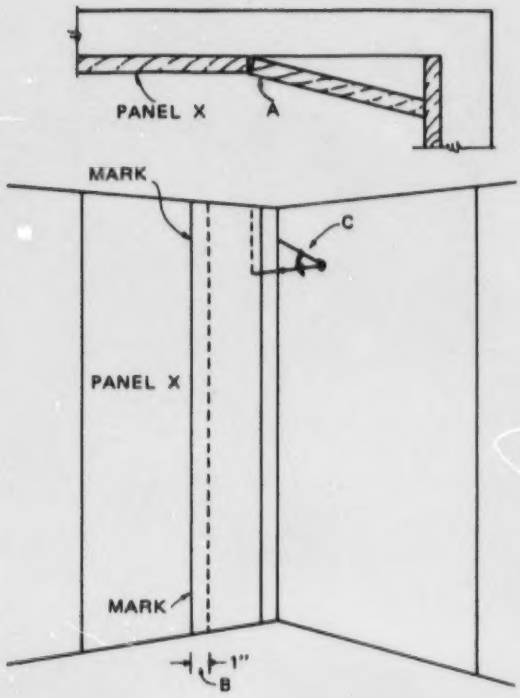



Fig. 3-7. Scribing and cutting in the last piece of paneling

**Fastening the Panels**

Panels can be fastened with finishing nails, staples, or adhesives. Nails or staples should be spaced 6 to 8 inches on centers along the edges of the panels and 12 inches on centers in the field. Nails should be set below the surface, and the holes should be filled with putty that is colored to match the paneling. Staple heads also are colored to match the finish of the paneling.

Carpenters are discovering that gluing is a very convenient and satisfactory method of applying panels. Contact cement and other construction adhesives are available. By carefully following the instructions that come with the product, the carpenter should achieve a good bond; however, plywood panels should not be glued directly to old plastered walls.

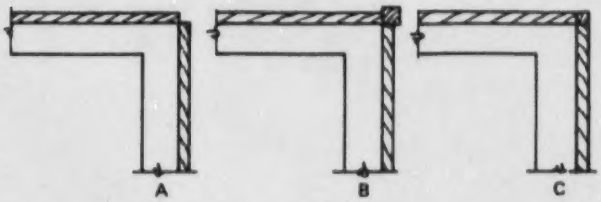



Fig. 3-8. Fitting the flush outside corner

**Hardboard Paneling**

Tempered hardboard panels are made from processed wood chips. These panels are produced with a variety of designs imprinted on the surfaces. The application methods are basically the same as those used for plywood panels. These hardboard panels can be fastened with nails, adhesives, or special clips.

**Solid Wood Board Paneling**

Wooden boards 4 to 12 inches wide are sometimes used to finish a wall. Fir, pine, cedar, redwood, spruce, and hemlock are frequently used in this type of wall finish.

The boards may be applied vertically, horizontally, or diagonally to achieve the desired effect. Where the boards are applied vertically, horizontal blocking or furring strips should be placed as illustrated in the assigned material.

Board paneling is produced in a variety of styles, four of which are shown in Fig. 3-9. The tongue-and-groove boards can be blind-nailed through the tongue; however, the other styles have to be applied with face nails or adhesives.

The method of solid board application is similar to that described for plywood. The first board on the wall should always be carefully plumbed, and the same scribing procedure should be used.

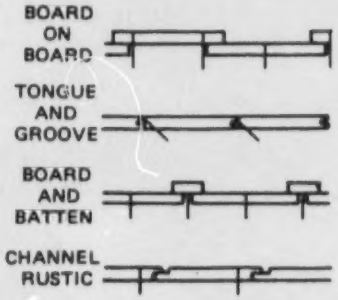



Fig. 3-9. Board patterns and nailing systems

**Study Assignment**

1. Durbahn and Sundberg, *Fundamentals of Carpentry*, Vol. 2 (Fifth edition). Read the material on interior wall coverings in Cnapter 7.
2. *California Contemporary House Plans.* Study the interior elevations on sheets 13 and 14 of the blueprints.
3. *Dwelling Construction Under the Uniform Building Code* (Latest edition). Whittier, Calif.: International Conference of Building Officials. Study Table 47-J.

INTERIOR FINISH

TOPIC 3 – FINISH INTERIOR WALL COVERINGS

**Study Guide**

Determine the correct word for each numbered blank in the sentence, and write it in the corresponding blank at the right.

1. Some of the types of panels in use are 1 , 2 , 3 , and 4 . — 1. _____ 2. _____ 3. _____ 4. _____

2. Plywood panels are usually surfaced with 5 6 . — 5. _____ 6. _____

3. In new construction it is recommended that 7 8 be placed over the studs before the panels are applied. — 7. _____ 8. _____

4. Furring strips should first be attached to 9 or 10 walls. — 9. _____ 10. _____

5. The best outside corner joint for panels consists of either a 11 piece or corner 12 . — 11. _____ 12. _____

6. Panels are fitted together with either a 13 joint or a 14 joint. — 13. _____ 14. _____

7. The first panel applied to the wall should be carefully 15 . — 15. _____

8. Panels can be fastened to the wall with 16 , 17 , or 18 . — 16. _____ 17. _____ 18. _____

9. A type of board paneling that can be blind-nailed to the wall is called 19 and 20 . — 19. _____ 20. _____

10. Most paneling is stained, sealed, and varnished at the 21 22 . — 21. _____ 22. _____

## TOPIC 4 – INSTALLATION OF JAMBS IN INTERIOR DOOR OPENINGS

This topic is planned to provide answers to the following questions:

- **How are wooden jambs assembled and installed?**
- **How is casing applied to finish the door opening?**
- **When are metal door frames used, and how are they installed?**

Door jambs are the frames that form the finish door openings. In residential buildings the jambs usually are made of wood; however, metal jambs are common in commercial and public buildings.

To obtain information regarding the interior door jambs for a building, the carpenter must read the specifications and study the details and door frame section drawings of the blueprints.

The traditional method of jamb installation is to set the jamb first and then hang the door. Today, the prehung door is widely used, and the jamb and door are installed as a unit. (See the section on prehung doors in Topic 5.) In remodeling work, however, the traditional method is still often used. For this reason a well-rounded finish carpenter should know both systems.

The door jamb must be set plumb on its two sides and level at the top (head jamb). If the carpenter has not done this, the door will be more difficult to fit to the opening.

When the jambs have been nailed in place, a wooden molding or casing is applied to each side of the jamb. The casing covers the space between the jamb and the wall and finishes the door opening (views A and B in Fig. 4-1).

The casing helps to secure the jamb to the wall. (Note that the casing material is "backed out." This allows for a tight fit against the jamb and the wall, even if some unevenness exists between the jamb and the wall.)

The two principal types of jambs are shown in View B of Fig. 4-1. Rabbeted jambs usually are

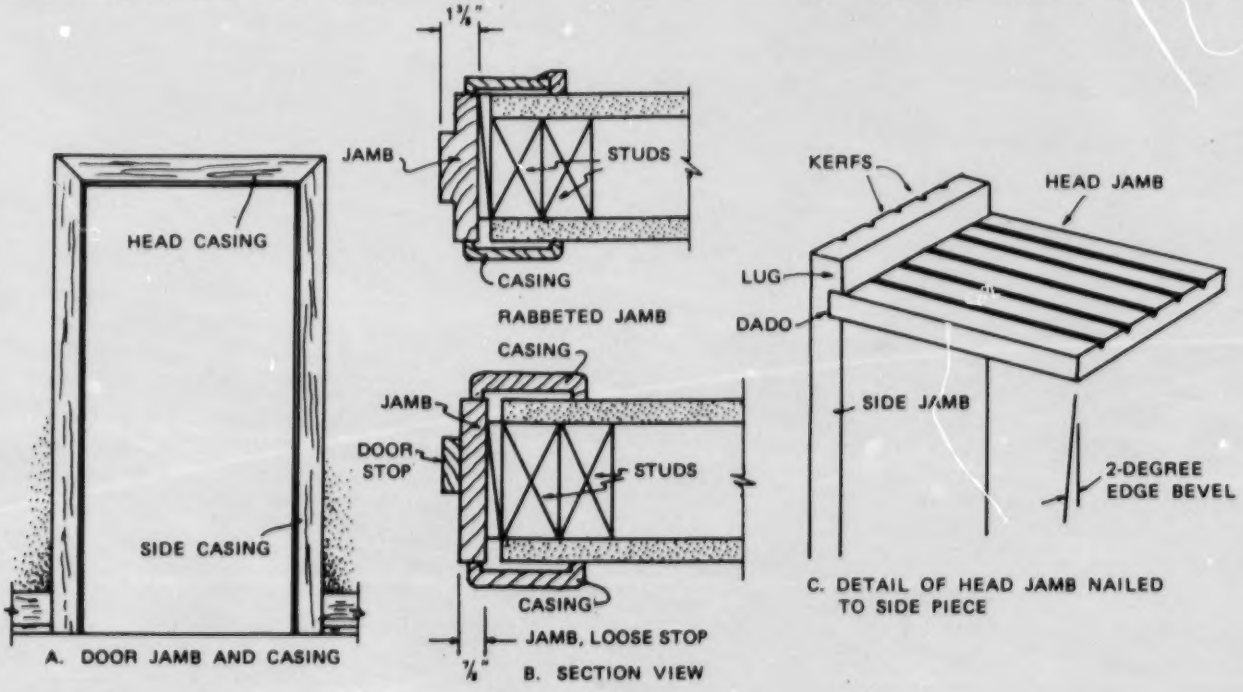



**Fig. 4-1. Wooden door jamb and cased opening**

1 3/8 inches at the thickest section. The nailed stop type is usually 7/8 inch thick. The width of the jamb equals the width of the studs plus the thickness of the wall finish material on both sides. The side jambs should be dadoed 1/4 inch to receive the head piece. To minimize cupping, the backs of the side and head pieces should be kerfed as shown in View C of Fig. 4-1. Another good practice is to slightly bevel the edge of the jamb. By beveling the edge, the carpenter ensures a tight fit where the casing bears against the edge of the jamb.

### Assembling Wooden Door Jambs

The side jamb materials usually are a little longer than required, and the side pieces are dadoed. If the head jamb is not precut, it can be cut from stock. For a door 2 feet 6 inches wide and 6 feet 8 inches high, the jamb would be constructed as follows:

1. To the width of the door add 1/4 inch at each end to fit into the dado for a total of 2 feet 6 1/2 inches. To this measurement add another 1/8 inch to reduce the amount of planing necessary to fit the door. The total length of the head piece will be 2 feet 6 5/8 inches, leaving a clearance of 2 feet 6 1/8 inches between the side jambs.
2. Nail the jambs together using 8d box or casing nails.
3. Measure from the bottom of the head piece 6 feet 8 1/2 inches, and cut the side jambs to that length. This will allow enough clearance under the door for thinner finish floor covering such as vinyl tile or 5/16-inch-thick hardwood. The use of a thicker floor covering will require that the door be cut later for clearance. Therefore, longer side jambs may be advisable to avoid the necessity of trimming the door.

### Installing the Wooden Door Jamb

The recommended method for installing a wooden door jamb is as follows:

1. Construct the jamb, and set it in the rough opening. Place a pair of shim shingles on both sides at the top of the jamb so that there is the same space on each side. The rough opening should be laid out to allow 1/2-inch clearance on each side of the jamb. Be sure that the edges of the jamb are flush with the outside of the walls. Tack the top of the jamb (views A and B in Fig. 4-2).
2. Place shingles at the bottom of the jamb and plumb the hinge side (side from which the door will be hung), using a straightedge and level. Tack the bottom of the jamb (View C in Fig. 4-2).
3. Turn the straightedge around, and straighten the jamb. Be sure to put a pair of shingles 7 inches down from the top and 11 inches up from the bottom where the hinges will be placed. Place paired shingles wherever they are needed to straighten the jamb (View D in Fig. 4-2).
4. Set a steel square against the plumbed side of the jamb, and ensure that the head piece is square to the side piece. A larger square cut from plywood is often used for this operation (View E in Fig. 4-2).
5. Prepare a spacer board for the opening. Square one end of a piece of board that is as wide as the jamb stock. Hold it up to the top of the jamb. Mark it the same length as the distance between the two side pieces; square a line, and cut the board. Place the board on the floor between the side pieces of the jamb. Drive shingles behind the side of the jamb that has not yet been straightened until it is firmly against the end of the spacer board. This will make the distance at the bottom the same as at the top (View F in Fig. 4-2).
6. Straighten the lock side of the jamb, using the straightedge. Ensure that a pair of shim shingles is placed 3 feet up from the floor, as this is where the lock will be installed. Place shingles wherever they are needed to straighten the jamb, and nail the jamb (View G in Fig. 4-2).

When they first place the shim shingles and straighten the side jamb, some carpenters drive a single nail below or above (but not through) the shingles. This is done so that the shingles can be readjusted easily. Later, 8d finish nails can be driven near the two edges of the jamb and through the shingle. The final operation is to cut the shim shingles off flush with the jamb, taking special care not to scar the edges of the jamb with the saw.

An alternative method may be used, particularly when a prehung door unit is to be installed. The carpenter shims a trimmer, preferably on the hinge side, straight and plumb before the unit is placed in the opening. After ensuring that the head piece is level, the carpenter nails the jamb side to the plumbed trimmer securely. Using the door as a

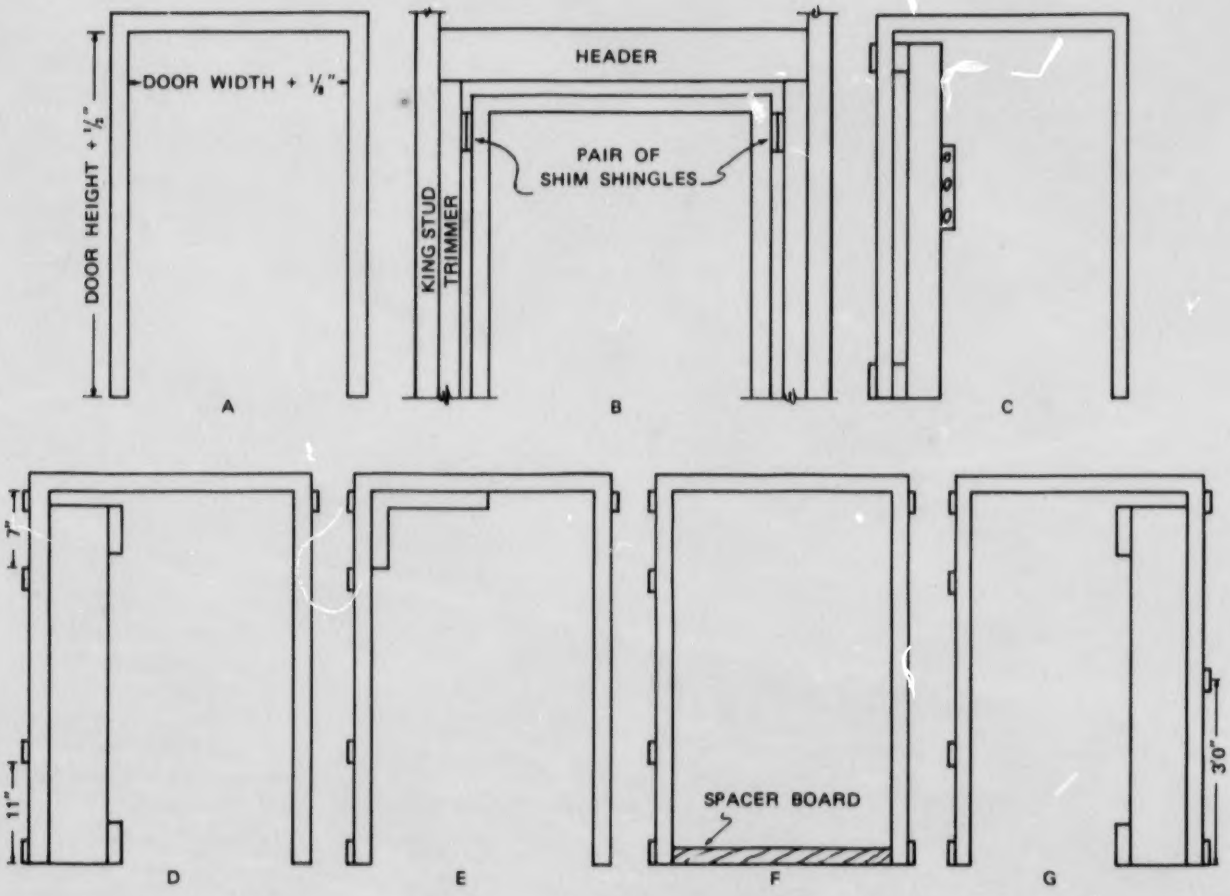



**Fig. 4-2. Installation of the wooden door jamb**

guide for the proper clearance, the trimmer on the lock side and the jamb side is moved by placing shim shingles between the trimmer and the king stud. When the proper clearance is obtained, the unit is nailed securely. This method is used when door units are set before drywall or paneling is installed.

### Trimming the Door Opening

Before the casing is applied to the opening, points should be marked on the edge of the jamb ¼ inch in from the face. The inside edge of the casing should be set to these marks. This ¼-inch reveal makes a better appearance, and it keeps the casing out of the way of the hinges when the door is hung.

The 90-degree joint between the head and side pieces of the casing requires 45-degree miter cuts. These cuts can most efficiently be made with a wooden miter box; however, when only a few cuts are required, a combination square can be used for marking, and the cuts can be made freehand. A block plane should be used for any additional fitting at the joints.

One recommended method of applying the casing around the door opening is as follows:

1. Set one side piece up against the jamb, mark it, and cut a 45-degree miter (View A in Fig. 4-3).
2. Tack the side piece in place. Cut a 45-degree miter on one end of the head casing and fit it against the side piece. Maintain the ¼-inch reveal, and mark the other end of the head casing (View B in Fig. 4-3).
3. Cut the second end of the head piece, and tack it in place (View C in Fig. 4-3).
4. Hold the second side piece to the head piece, and mark. Make the length of this

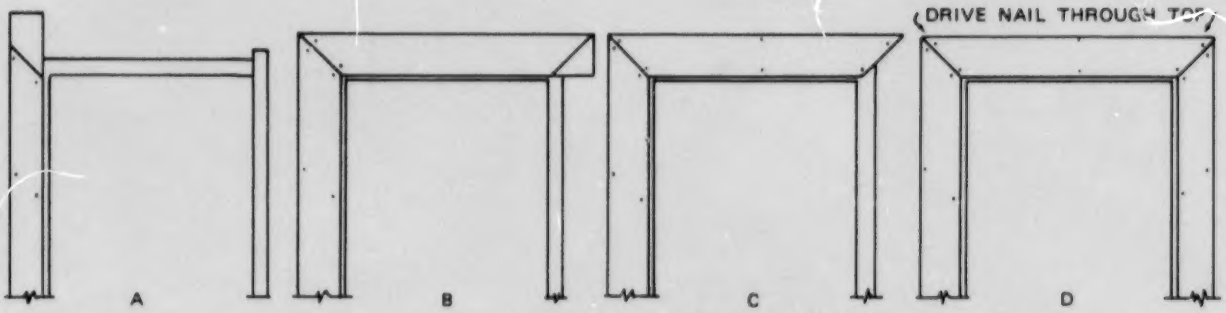



Fig. 4-3. Installation of casing at the door opening

piece a little longer to allow for fitting; then cut and tack it in place. Apply white glue to the miter joints and drive a nail through the top to prevent the joints from opening. Secure the entire casing with 4d or 6d nails along the jamb edge and 8d nails at the studs. Space the nails 16 inches on centers. The casing may have to be straightened as it is being nailed. A good procedure is to nail into the stud and then into the jamb. This eliminates the possibility of bending the jamb if the casing material has a definite twist (View D in Fig. 4-3).

### Placing the Door Stops

The door stops can be tacked in place. (They will be nailed permanently after the door has been hung.) The stops should be placed a little beyond the point needed to accommodate the thickness of the door. A mitered or butt joint can be used where the side stops meet the top piece, as shown in Fig. 4-4. If a butt joint is used, the top piece should be run the full width of the opening, and the side stops should be butted against it.

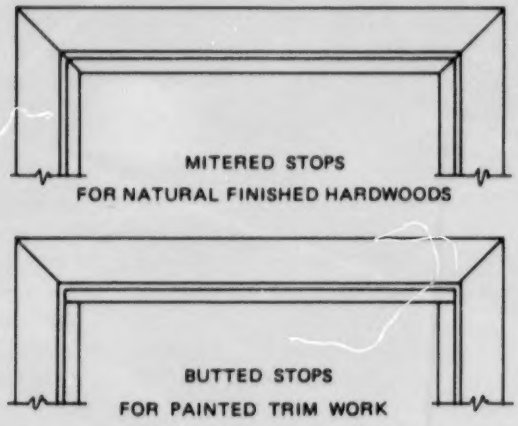



Fig. 4-4. Mitered and butted door stops

### Installing Metal Door Frames

Metal frames have long been in use in commercial and public buildings. They can be fastened to wood stud, concrete, metal lath, or plastic walls. The great increase in the use of gypsum wallboard on wood or metal studs has also increased the use of metal door frames that are specifically designed for this type of wall. The metal frame does not require any additional trim because the casing is part of the frame and the frame is applied after the wallboard is in place. Metal frames that are already welded or set up as a single unit have been designed for concrete wall, wood stud, or other openings. The frames are anchored in place with various types of anchors or expansion shields, and the walls are built to the frames.

The "drywall" frames can be quickly assembled and installed on the job.

The installation of a metal frame in a wood stud wall is shown in Fig. 4-5. The frame is installed as follows:

1. Install four adjustable stud anchors per frame jamb.
2. Bend anchor nailing tabs around wood studs.
3. Set bottom spreader, and level frame.
4. Nail anchors to studs, and check plumb and square of frame when nailing.

Metal frames can be erected in a steel stud wall as shown in Fig. 4-6. The recommended procedure is as follows:

1. Install four adjustable stud anchors per frame jamb.
2. Set one jamb stud (hinge side of frame) plumb and square.
3. Place frame tight against stud. Attach frame jamb plumb and square to stud.
4. Set bottom spreader, and level frame.

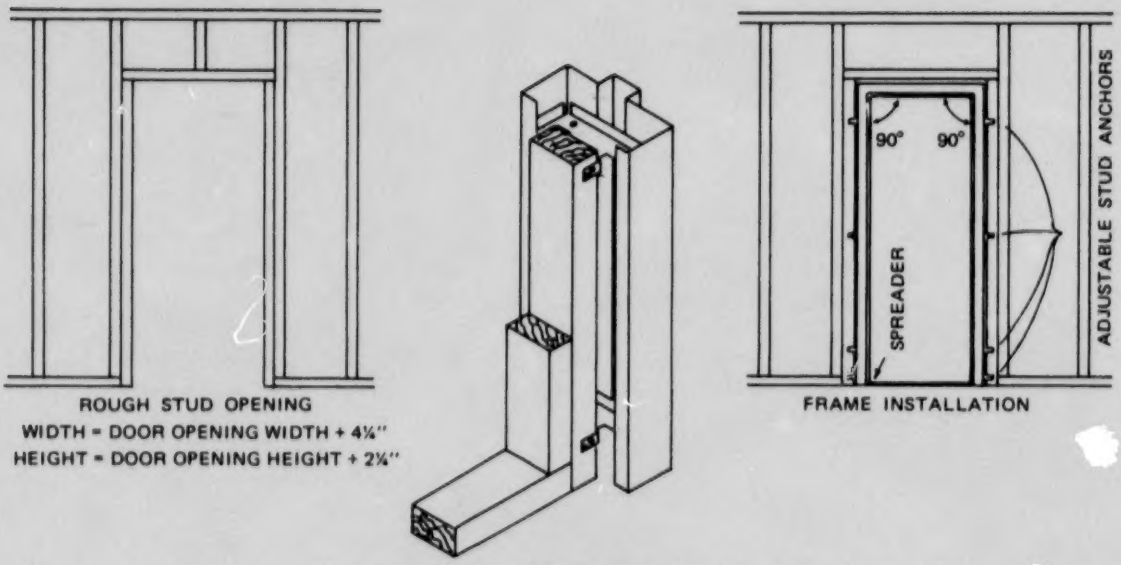



Fig. 4-5. Installation of metal door frame in wood stud wall

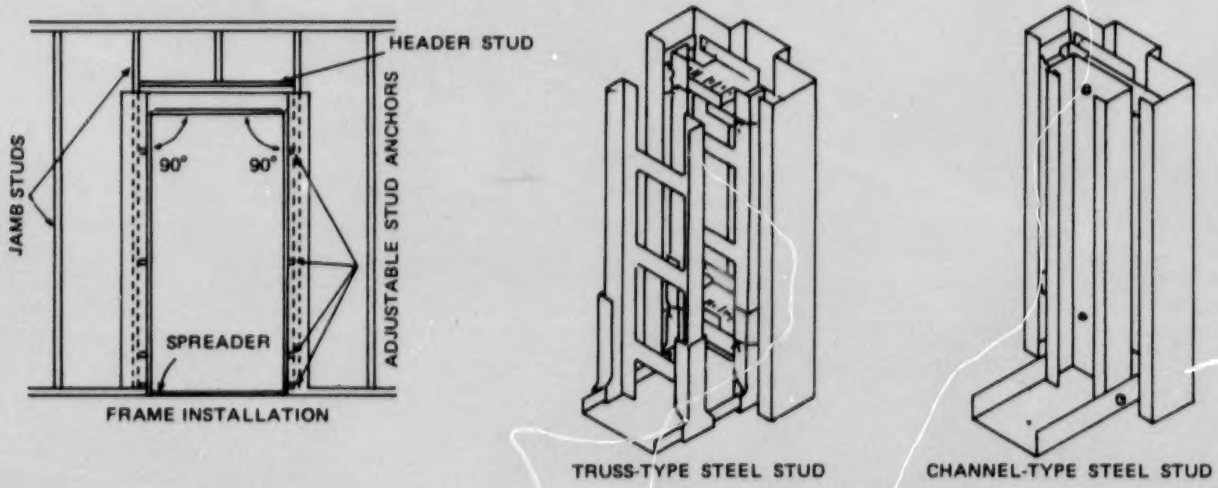



Fig. 4-6. Installation of metal door frame in steel stud wall

5. Slide opposite stud tight against frame anchors, and attach frame jamb plumb and square. Attach header stud.

The assembly of metal frames is illustrated in Fig. 4-7.

### Assembling and Installing the Drywall Frame

The methods of plumbing, squaring, and aligning the metal frames are similar to those used on wooden frames; however, the methods of assembly and installation are different. Some of the design features and methods of installation are shown in Figs. 4-8 and 4-9. The drywall frame is installed as follows:

1. Fasten the head piece to the side piece, and secure the adjustable clip to the wall (View A in Fig. 4-8).
2. After the side piece has been plumbed, secure the sill anchor to the bottom plate of the wall (View B in Fig. 4-8).

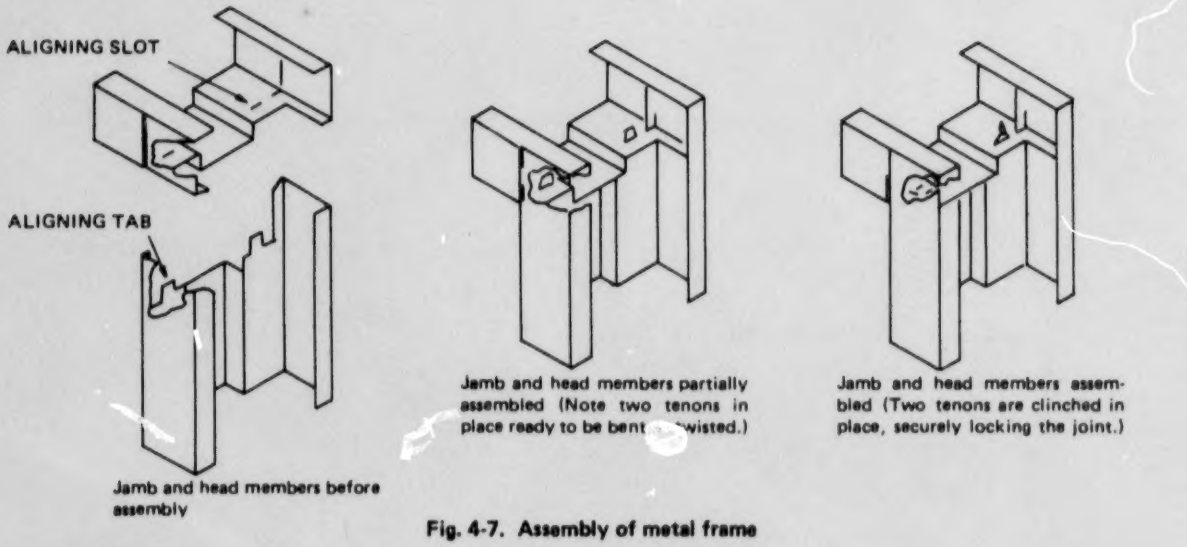

ALIGNING SLOT
ALIGNING TAB
Jamb and head members before assembly
Jamb and head members partially assembled (Note two tenons in place ready to be bent or twisted.)
Jamb and head members assembled (Two tenons are clinched in place, securely locking the joint.)

**Fig. 4-7. Assembly of metal frame**

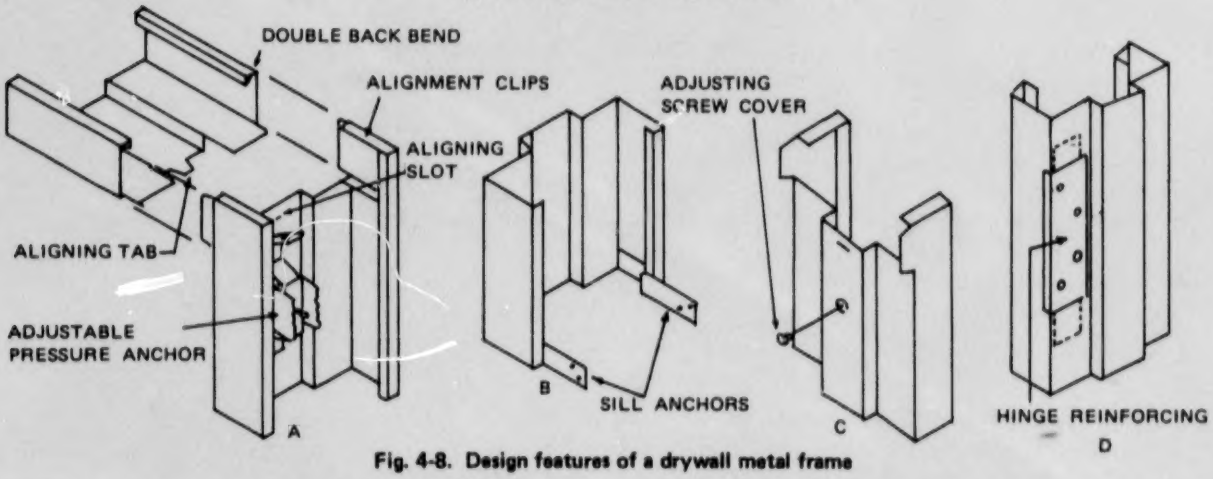
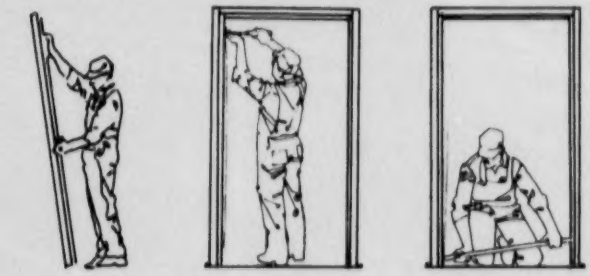



**Fig. 4-8. Design features of a drywall metal frame**

3. Screws, which can be driven from the exposed surface of the jamb, go into the clips fastened to the wall. The side pieces can thus be straightened and aligned. Before the adjusting screw can be secured, the plug must be removed from the hole (View C in Fig. 4-8).
4. The metal frames are precut, reinforced, and drilled to receive the lock strike and butt hinges (View D in Fig. 4-8). The reinforcement consists of extra strips of metal at the places where the lock strike and butt hinges are installed.

### Study Assignment

Durbahn and Sundberg, *Fundamentals of Carpentry*, Vol. 2. (Fifth edition). Read the sections on setting inside door jambs and metal doors and frames in Chapter 7.



1. Install hinge jamb with anchors attached over wall. (Rough opening to be equal to door opening width plus 2" and door opening height plus 1".)
2. Install header and strike jamb. Adjust anchor screws in both jambs.
3. Insert wood spreader to size opening and fasten sill anchors to wall.

**Fig. 4-9. Installation of the drywall metal frame**

## INTERIOR FINISH

## TOPIC 4 – INSTALLATION OF JAMBS IN INTERIOR DOOR OPENINGS

### Study Guide

Determine the correct word for each numbered blank in the sentence, and write it in the corresponding blank at the right.

1. The finish frames for door openings are called 1 and are made of 2 or 3 . — 1. _____ 2. _____ 3. _____

2. A door jamb should be 4 on two sides and 5 at the head piece. — 4. _____ 5. _____

3. The trim that covers the space between the jamb and the wall is called 6 . — 6. _____

4. The side pieces should be 7 to the depth of 8 inch to receive the head piece. — 7. _____ 8. _____

5. The height of the jamb should ordinarily be 9 inch higher than the door. — 9. _____

6. When the jamb shim is to be installed, shingles should be placed 10 inches down from the top and 11 inches up from the bottom on the hinge side jamb. — 10. _____ 11. _____

7. The casing should be held back 12 inch from the edge of the jamb. — 12. _____

8. A door stop can be either 13 or 14 at the side-to-head joint. — 13. _____ 14. _____

9. A metal door frame that has gained in popularity in recent years is specifically designed for walls made of 15 16 applied to metal 17 . — 15. _____ 16. _____ 17. _____

10. Metal door frames are anchored in place with 18 shields. — 18. _____

## TOPIC 5 – FITTING AND HANGING INTERIOR DOORS

This topic is planned to provide answers to the following questions:

- **What are the differences between panel and flush doors?**
- **How are doors fitted and installed?**
- **How are cylindrical locks installed?**
- **How are prehung doors installed?**
- **What are sliding and folding doors?**

Most doors used in modern construction are known as "flush" doors; however, panel doors are still very much in demand, and they are manufactured in a variety of patterns and styles (Fig. 5-1).

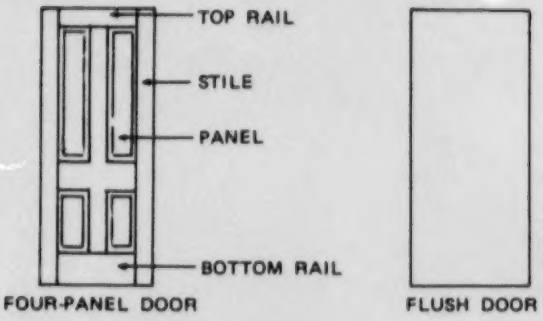



**Fig. 5-1. Basic types of doors**

### Types of Doors

In panel doors the rails and stiles are usually 1 ¾ or 1 ⅜ inches thick and the panels are ¾ inch thick. Exterior panel doors frequently have single or multiple glass lights. (A light is a pane of glass.)

A flush door consists of a wood frame covered with face panels (skins) that are usually three-ply (⅛-inch-thick) plywood. The surface material can be softwood, such as fir or pine, which will probably be painted. The surface may also be hardwood veneer, such as mahogany, oak, or walnut, which will take a stained finish.

The different inside structures (cores) of flush doors are illustrated in the assigned material.

The basic types of cores in flush doors are solid, hollow, and fibrous.

A solid-core door consists of staggered wooden blocks with a plywood face. Such doors are heavier and more expensive than the other types.

Hollow-core doors are light and easy to handle, but they are not recommended for use as exterior doors. The core consists of thin horizontal strips running the width of the door. Some of these doors have vertical strips in addition to the horizontal strips. Solid blocks are placed at the height where holes for cylindrical locks may be bored. These doors tend to warp, and they will not wear as well as solid-core doors; however, they are widely used because they are less expensive than solid-core doors.

Fiber-core doors are used where sound transmission is a major concern. Also, doors that are specially designed for fire resistance (fire doors) have fiber cores.

Doors are made in standard thicknesses and sizes. Interior doors are usually 1 ⅜ inches thick, and exterior doors are 1 ¾ inches thick. Interior doors are usually 2 to 3 feet wide. A door in a residence is usually 6 feet 8 inches high, whereas a door in a commercial building is usually 7 feet high.

### Methods of Fitting and Hanging Doors

Although prehung doors are becoming common in the industry, enough situations still exist where doors are hung in the traditional manner. The carpenter should know the correct methods. In remodeling work doors often have to be hung on existing jambs. In commercial work wooden doors are often fitted and hung on steel jambs that are already in place.

### Use of Hand Tools in Hanging Doors

The door must be placed in a stable position while it is being worked on. Carpenters use various rigs ranging from the commercially manufactured clamp to a notched 2 x 4 block and wedge (Fig. 5-2). The portable woodworker's vise also can be used effectively (Fig. 2-9).

The first step in hanging a door is to place it in the opening to determine how much fitting has to be done. If the jamb was constructed to have an opening ⅛ inch wider than the door (as suggested

in Topic 4), no planing should be necessary in order to place the door into the opening. Before the door is removed from the opening, the top of the door should be marked with a T. This will prevent mistakes when the door is moved out of the opening and placed in the door jack.

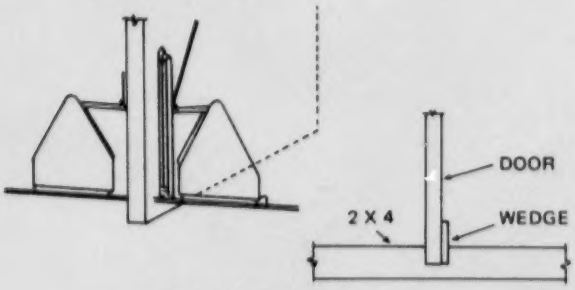



Fig. 5-2. Door jacks

**Fitting Door and Marking Hinges**

In the process of checking the door for fit, the carpenter should scribe and mark where the door has to be planed. When the door is secured in the door holder, the necessary planing should be done with a fore or jack plane. When the door is placed back into the opening, the carpenter should proceed as follows:

1. Place a wedge under the door (Point A in Fig. 5-3) to achieve the desired clearance at the top of the door.
2. Measure down 7 inches from the top of the door, and establish the location of the top hinge. Mark the door and jamb at the same time with a sharp knife (Point B in Fig. 5-3).

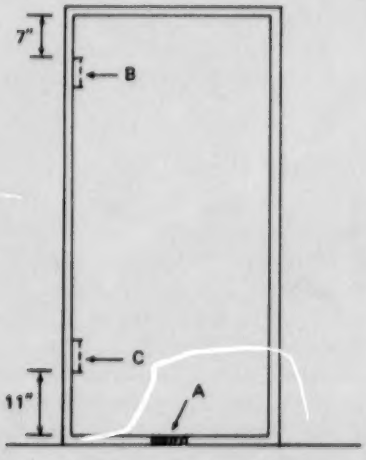



Fig. 5-3. Fitting door and marking hinges

3. Measure up 11 inches from the bottom of the door to establish the location of the bottom hinge (Point C in Fig. 5-3). Mark the door and jamb with a knife as before. If the door is heavy, a third hinge may be required. It should be centered between the top and bottom hinges. (Some carpenters prefer to only mark the door at this time and fasten one leaf of each hinge onto the door.) The door is then placed back into position, and the jamb is marked off from the already gained-in hinge onto the door jamb.

**Laying Out Gain for the Hinge**

The gain for the hinge is laid out as follows:

1. Place one leaf of the hinge so that one side lines up with the knife mark. Mark the two sides of the hinge with a knife (Points A in Fig. 5-4).

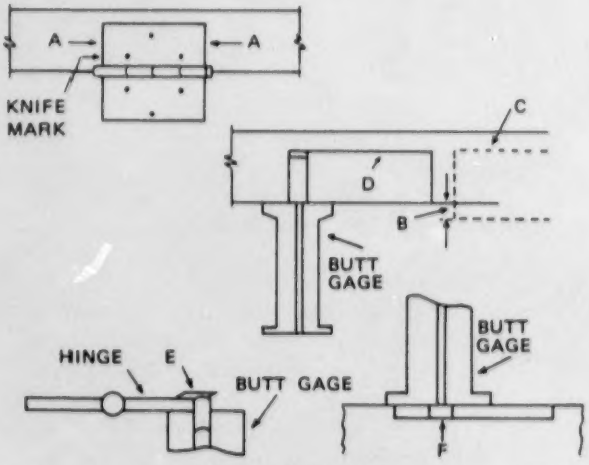



Fig. 5-4. Laying out gain for the hinge using a butt gage

2. Bring the hinge out to the position it will extend past the door. This clearance should be at least one-half the overall thickness of the door trim (casing) (Point B in Fig. 5-4).
3. Score a short mark with the knife (Point C in Fig. 5-4).
4. Set one of the legs of the butt gage to this point, and score a line with the spur, marking the location of the inside edge of the hinge (Point D in Fig. 5-4). The preceding procedure (steps 1 through 4) may be eliminated by using a butt marker (Fig. 2-8) to mark the perimeter of the hinge leaf.

5. Using the hinge as a guide, set the other spur of the butt gage to a mark slightly greater than the thickness of the hinge leaf (Point E in Fig. 5-4).
6. Use the butt gage to score the door at each hinge location to the depth of the hinge gains (Point F in Fig. 5-4).

**Placing the Hinge**

The hinge is installed as follows:

1. Using a 2-inch butt chisel, notch at an angle to the depth of the gain (Point A in Fig. 5-5).
2. Holding the chisel flat, clean out the gain (Point B in Fig. 5-5).
3. Screw one leaf of the hinge to the door. Be sure the top of the hinge is toward the top of the door. Drill the pilot hole slightly off center so that the leaf will be drawn into the gain as the screw is tightened (Point C in Fig. 5-5). A spiral ratchet screwdriver should be used for this job. Be sure the head of the loose pin is toward the top of the door (Point D in Fig. 5-5).

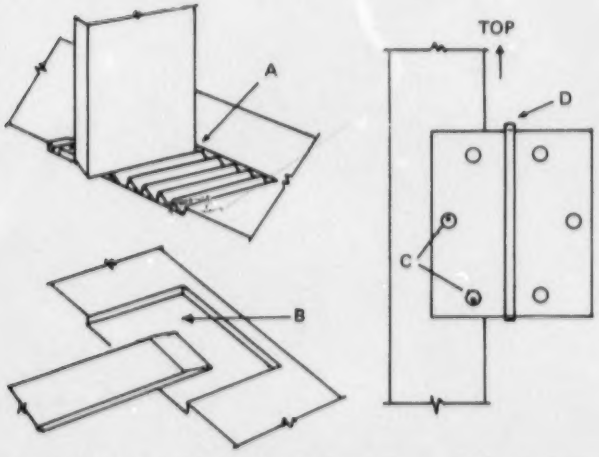



**Fig. 5-5. Notching and clearing the gain and placing the hinge**

4. With the butt gage already adjusted to the width and depth of the gain, lay out and mortise the hinge gains on the jamb, repeating the same process that was used on the door.
5. Pull the loose pin out of the hinges, remove the free leaves, and screw them into the jamb. Hang the door into place by aligning the leaves of the hinges, and replace the pins.

**Checking for Clearance**

The carpenter should check the clearance on the hinge side between the edge of the door and the jamb. (Painted doors require $\frac{3}{32}$-inch clearance at the top and sides; stained doors should have a clearance of about $\frac{1}{16}$ inch.) If there is too little clearance, the hinges may bind. Too much clearance indicates a sloppy job. A simple way to adjust the door in the opening is shown in Fig. 5-6.

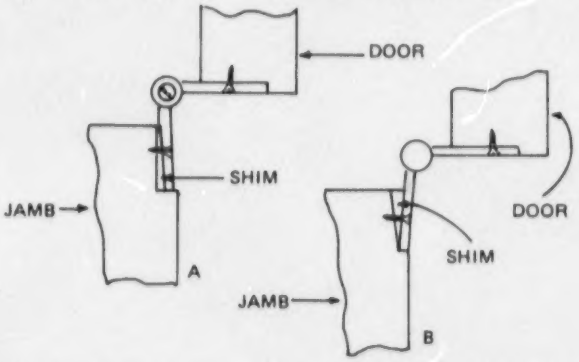



**Fig. 5-6. Using cardboard shim to adjust clearance on hinge side of door**

A method of adjusting for too much clearance is shown in View A of Fig. 5-6. A cardboard shim is placed at the back of the hinge. The front of the hinge is tipped back, drawing the door closer to the hinge jamb.

A method of adjusting for too little clearance is shown in View B of Fig. 5-6. A cardboard shim is placed under the front edge of the hinge. The hinge is tipped out, pushing the door away from the hinge jamb and toward the lock jamb.

When the clearance on the hinge side is sufficient, the carpenter should determine if more fitting is needed to obtain equal clearance on the lock side of the door. The lock side will have to be beveled about $\frac{1}{8}$ inch; otherwise, the inside of the door will hit the jamb when the door is being closed (Fig. 5-7).

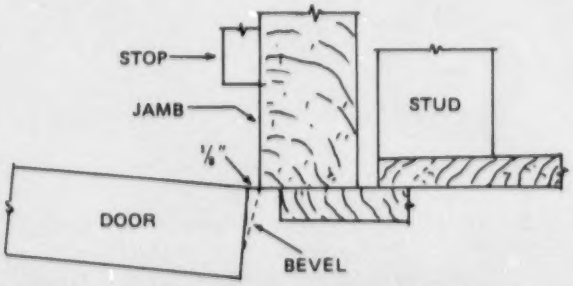



**Fig. 5-7. Beveling for clearance on the inside edge of door**

### Use of Power Tools in Hanging Doors

When power tools are used to hang a door, the power plane (Fig. 2-10) is used for planing and fitting.

The gains for the hinges can be cut with the electric router. This tool is used with a hinge template kit, which is tacked to the door and transferred to the jamb. These templates are made by a number of different manufacturers, but they are similar in design. The use of these kits is described in the assigned material. The manufacturers' instructions should be followed.

The hinge template kit, which is used for installing two or three hinges, can be adapted for different door heights. The templates, which are adjustable for different hinge sizes, act as guides for the electric router.

### Installation of Door Locks

A very popular and widely used lock is the cylindrical lock (Fig. 5-8). A new lock set includes templates for positioning the holes for the cylindrical case and the latch unit.

The recommended procedure for installing a cylindrical lock is as follows:

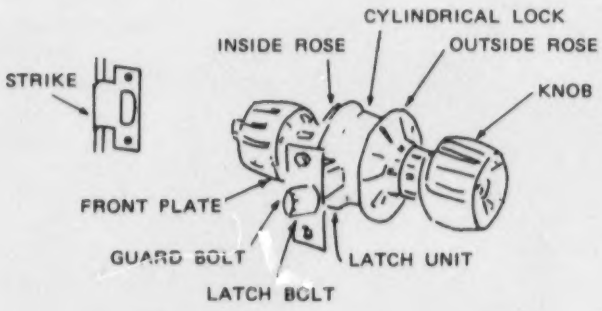



**Fig. 5-8. Cylindrical lock and strike**

1. Measure up the distance from the floor to the center of the lock. This distance can be either 36 or 38 inches (Point A in Fig. 5-9).
2. Square a line across the edge and side of the door (Point B in Fig. 5-9).
3. Measure the backset, which is the distance from the face of the latch unit to the center of the cylindrical case (Point C in Fig. 5-9).
4. Mark the center of the hole for the latch unit (Point D in Fig. 5-9).
5. Bore the hole for the cylindrical case. A brace and expansive bit can be used for this, if the right size lock set bit is not available (Point E in Fig. 5-9).
6. Bore the hole for the latch unit (Point F in Fig. 5-9).
7. Mortise out for the front plate. The lock can now be installed (Point G in Fig. 5-9).
8. Close the door, and mark the center of the latch bolt on the jamb (Point H in Fig. 5-9).
9. Lay out and mortise the strike on the jamb (Point I in Fig. 5-9).

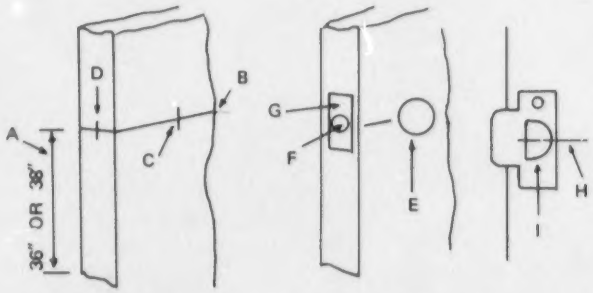



**Fig. 5-9. Layout for the installation of a cylindrical lock**

Most of the major manufacturers of locks produce lock boring jigs. These are used in conjunction with electric drills and lock-set bits to bore the hole for the lock. The Schlage boring jig can be adjusted for a $2\frac{3}{8}$-, $2\frac{3}{4}$-, or 5-inch backset (Fig. 5-10). It has a removable bushing adapter that is used to guide bits for drilling $\frac{7}{8}$- or 1-inch-diameter holes for the latch unit.

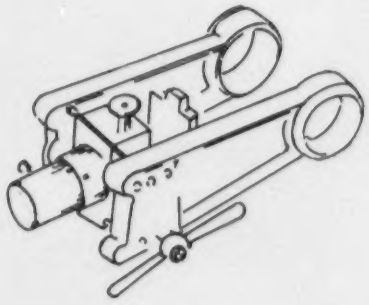


**Fig. 5-10. Lock boring jig**

### Door Arrangement

The size of each door and the direction it will swing are indicated on the floor plan. Understanding what is meant by a left-handed or right-handed door becomes important when mortise locks, door closers, panic bolts, and other types of door hardware are being installed. To find the hand of any door, one must observe the following rules:

1. Whether a door is right-handed or left-handed is always determined from the outside.
2. The outside of the door can be the street side of an entrance door or the corridor side of a door opening into a room.
3. The outside will normally be the key side of the door.

The different door arrangements are identified as follows:

*Right hand.* The door butts are on your *right*, and the door swings *away* from you (View A in Fig. 5-11).

*Left hand.* The door butts are on your *left*, and the door swings *away* from you (View B in Fig. 5-11).

*Right-hand reverse bevel.* The door butts are on your *right*, and the door swings *toward* you (View C in Fig. 5-11).

*Left-hand reverse bevel.* The door butts are on your *left*, and the door swings *toward* you (View D in Fig. 5-11).

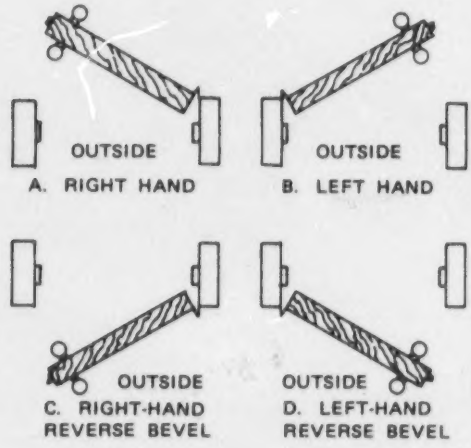



**Fig. 5-11. Door arrangements**

### Installation of Prehung Door

A prehung door is delivered with the hinges already applied to the jamb and door. The holes are usually bored for the lock. The casing material, which is mitered and cut to length, is bundled and delivered with the door. The stops are also fitted and tacked into place in the jamb.

This system facilitates the installation of the entire door unit. A recommended procedure for setting prehung door units is illustrated in Fig. 5-12 and described as follows:

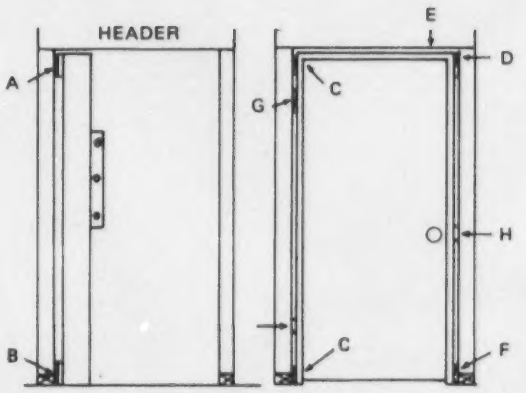



**Fig. 5-12. Installing the prehung door unit**

1. Place and tack shingles against the door trimmer at the top of the hinge side of the rough opening (Point A in Fig. 5-12). The thickness of the overlapping shingles should be the amount of clearance allowed on each side of the jamb.
2. Using a straightedge and level, plumb down and tack a pair of shim shingles at the bottom of the trimmer (Point B in Fig. 5-12).
3. Remove the stop on the hinge side of the prehung door unit, and place the unit in the opening. Nail the top and bottom of the hinge side of the jamb (where nail heads will be covered by stops) with 8d box nails (Point C in Fig. 5-12).
4. Place and snug shingles at the top of the lock side of the jamb (Point D in Fig. 5-12).
5. Adjust the head jamb to proper clearance at the top of the door. If necessary, either of the side pieces can be raised with a flat bar or chisel to square the head jamb to the door (Point E in Fig. 5-12).
6. Shim the bottom of the lock jamb to the proper clearance from the door (Point F in Fig. 5-12).
7. Place shingles behind the hinges (Point G in Fig. 5-12).
8. Place shingles where the lock strike will be installed (Point H in Fig. 5-12).

Additional shingles should be placed where they are needed to align the jamb to the door. When this is completed and nails are placed at each pair of shims, the stops can be nailed in place, the opening trimmed out with the casing, and the lock installed.

Another type of prehung door is known as the split jamb door unit (Fig. 5-13). The jamb is delivered in two sections with the casing already attached. This type of door is installed as follows:

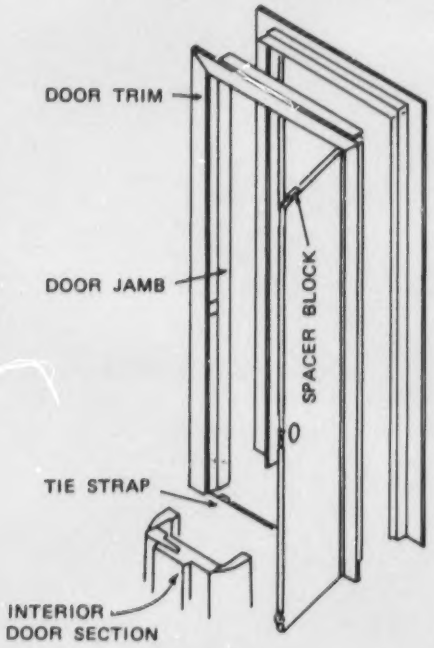



**Fig. 5-13. Split jamb prehung door unit**

1. Set the side of the frame containing the door into the opening.
2. Align the frame with shim shingles, and fasten it into place by nailing through the casing.
3. Insert the other half of the door frame into the grooved section that has already been installed.
4. Nail up the casing, and drive nails through the stops.

### Sliding and Folding Doors

The pocket-type sliding door is used where a swinging door would be inconvenient. It requires a track and roller assembly at the top and a guide to keep it in position at the floor. The wall pocket is framed in as required. A prefabricated unit for this kind of door would include detailed instructions for framing the pocket and installing the unit. These doors are illustrated in the assigned materials.

Bypass sliding doors are usually used for closets.

Folding doors can be used as a room divider. These doors are hung from a track in the ceiling.

A variation of the folding door system is the "bifold" unit. It is often used for closet openings.

The manufacturers of folding doors always provide detailed instructions. A typical bifold door is shown in Fig. 5-14. The first door next to the jamb has pivot pieces fastened to the top and bottom of the door. These pieces fit into pivot brackets, which hold the door in place and allow it to swing. The second door is fastened to the first door with mortised hinges. The center guide shown at the top of the second door slides along an aluminum track. A door aligner at the bottom of the center doors holds the two doors in a flush position.

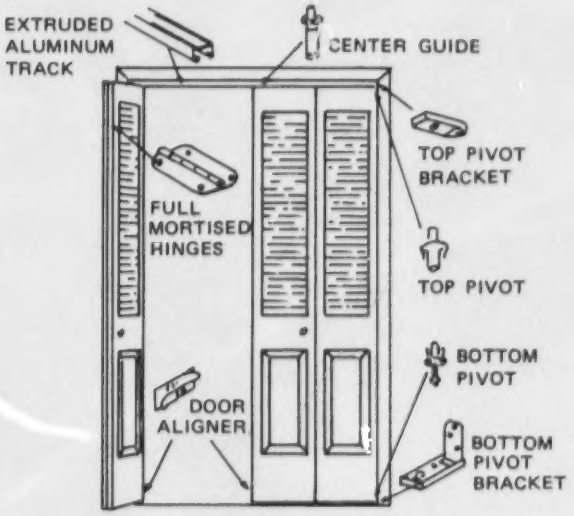



**Fig. 5-14. Folding door system**

### Study Assignment

1. Durbahn and Putnam, *Fundamentals of Carpentry*, Vol. 1 (Fifth edition). Study in Chapter 9 the section on finish hardware related to doors.
2. Durbahn and Sundberg, *Fundamentals of Carpentry*, Vol. 2 (Fifth edition). Study the section on doors in Chapter 7.
3. *California Contemporary House Plans*. Study the plans for first and second floors, sheets 3 and 4; and interior elevations, Sheet 13.

## INTERIOR FINISH

## TOPIC 5 – FITTING AND HANGING INTERIOR DOORS

### Study Guide

Determine the correct word for each numbered blank in the sentence, and write it in the corresponding blank at the right.

1. The two basic types of doors are the 1 and 2 doors. — 1. _____ 2. _____

2. The three types of cores used in the construction of flush doors are 3 , 4 , and 5 . — 3. _____ 4. _____ 5. _____

3. The hinges are placed 6 inches down from the top of the door and 7 inches up from the bottom. — 6. _____ 7. _____

4. The height of the lock from the floor is usually 8 inches in residential construction and 9 inches in commercial buildings. — 8. _____ 9. _____

5. A very convenient tool to use for the layout of the hinge gain is the 10 gage. — 10. _____

6. The lock side of a door should always be 11 so that the inside of the door will not hit the 12 when the door is being closed. — 11. _____ 12. _____

7. The two principal power tools used in door hanging are the electric 13 and 14 . — 13. _____ 14. _____

8. A new lock set will always include detailed 15 and a 16 for positioning the holes that have to be bored. — 15. _____ 16. _____

9. Prehung doors are delivered with the 17 already applied to the door and the jamb and a hole bored for the 18 . — 17. _____ 18. _____

10. The two types of sliding doors are called 19 and 20 . — 19. _____ 20. _____

## INTERIOR FINISH

## TOPIC 6 – WOOD MOLDING USED IN INTERIOR TRIM

This topic is planned to provide answers to the following questions:

- **What are the different kinds of wood molding, and where are they used?**
- **How does the carpenter trim out door and window openings?**
- **How does the carpenter apply baseboard and ceiling molding?**

Wood moldings are used to finish off (trim out) the interior of a building. Most of these moldings will be found around door and window openings (casing), at the bottom of the wall (base), and at the top of the wall where it meets the ceiling (cove or crown).

Wood molding is produced in a variety of softwoods. These are usually painted. The hardwood moldings may be stained or left with a natural finish. The different designs range from the more ornate and traditional to the plainer styles used in contemporary building design.

### Types and Designs of Moldings

A few of the wood molding designs used in residential buildings are shown in Fig. 6-1.

**Casing**

Casing is a trim molding used around door and window openings.

**Baseboard**

Baseboard is a molding installed at the bottom of a wall.

**Stop**

The stop is a strip against which the door closes. It serves the same function in casement windows. In the case of double-hung or sliding windows, the stop keeps the window in its proper position.

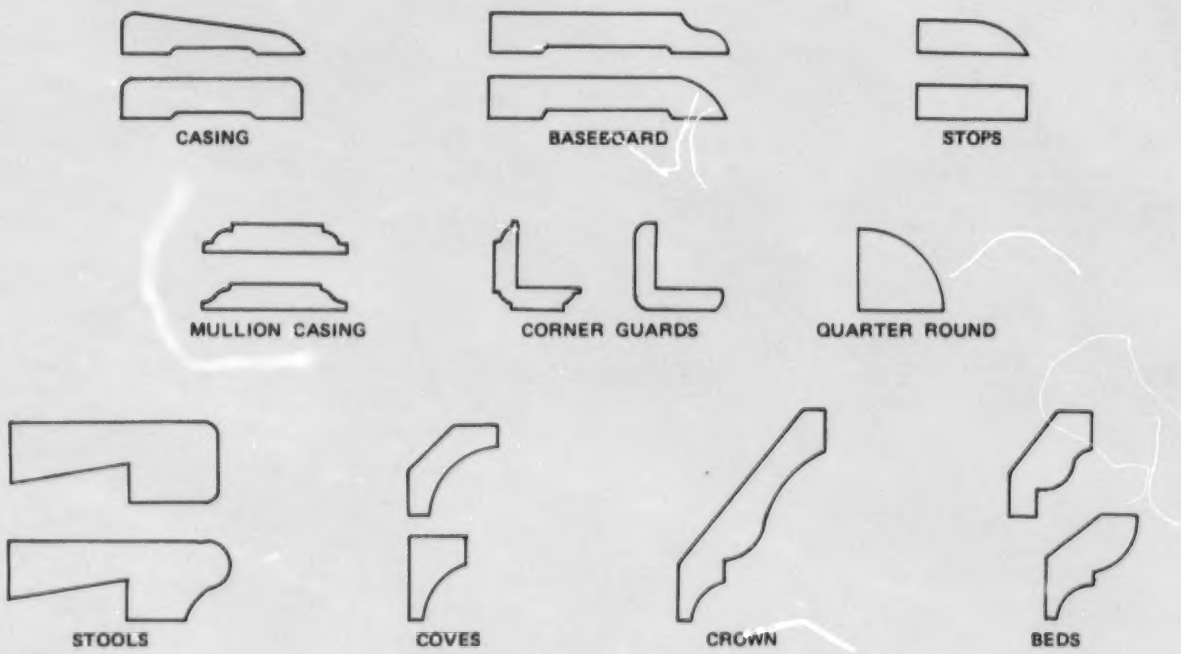



**Fig. 6-1. Section views of wooden moldings**

**Mullion Casing**

Mullion casing is a finish for the vertical dividing piece (mullion) between windows in the same frame.

**Corner Guard**

The corner guard serves as a protective cover for the outside corners formed by paneling.

**Quarter Round**

Quarter round is used as a molding for inside corner joints.

**Stool**

Stool molding is a flat level piece installed at the bottom, between the side pieces of the window frame. It is the inside finish at the window sill.

**Cove**

Interior cove is usually used to cover the joints between wall and ceiling.

**Crown**

Crown trim is an ornate ceiling molding.

**Bed**

Bed molding is used as a trim around ceilings. It is also used in exterior cornice design.

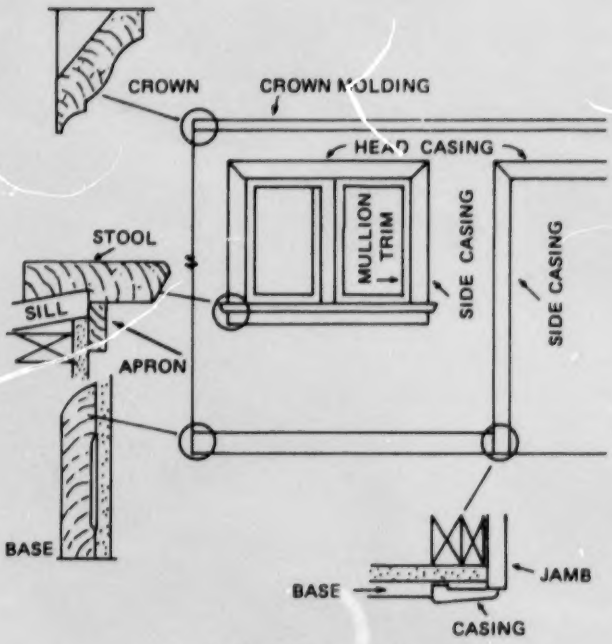



Fig. 6-2. Wall with typical trim

### Application of Interior Trim

A typical wall with door and window casing, mullion, stool, apron, base, and crown ceiling molding is shown in Fig. 6-2. First, the door and window openings are trimmed out, and then the ceiling molding and baseboard are installed. (One method of applying the door casing has already been described in Topic 4.)

### Trimming Out the Interior Window Opening

A recommended method of trimming out the window opening is as follows (Fig. 6-3):

1. Hold the stool against the window opening, and with a square held in position against the sides of the frame, mark lines at A. Set a scriber at X, and mark lines at B (left and right). The distance should be the same as the width of the rabbet as shown at X.
2. Cut out the stool, slip it into the opening, and tack it in place. To establish the amount the stool projects on each end beyond the jamb, add three measurements: ¼ inch reveal (C), width of the casing (D), and the distance from the face of the casing to the edge of the stool. This is the distance required at E.

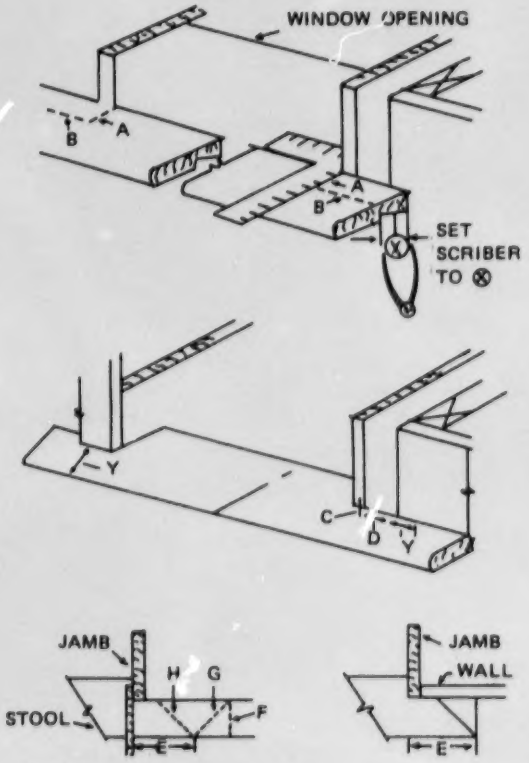



Fig. 6-3. Fitting the window stool

3. The end of the stool can be cut square, but this method will leave the end grain exposed. A neater finish will be achieved by making a 45-degree cut with a return. To use this second method, lay out two 45-degree angles as shown at G and H. Cut the line at F. Then make the first miter cut at G and the second miter cut at H. Glue and nail the end piece to the miter on the end of the stool.
4. Fit and nail the window casing by using the same system described for casing door openings in Topic 4. (In this case the bottom of the window casing rests on the stool piece as shown in Fig. 6-2.)
5. Fit and nail the mullion piece that covers the mullion between the stool and the head casing as shown in Fig. 6-2.
6. Fit and nail the apron piece as shown in Fig. 6-2. The ends should line up with the outside of the side casings. To achieve the best appearance, 45-degree returns should be made at the ends of the apron.

In one contemporary design the stool and apron are eliminated. The casing is applied completely around the four sides of the window, creating a "picture frame" effect as shown in Fig. 6-4.

Fig. 6-4. Picture frame window

## Fitting the Baseboard

The baseboard is held tight to the floor and nailed into the studs. A miter joint is required at the outside corners. A coped joint is best for inside corners. It will not open up when it is being nailed as will an inside miter joint, and there will be less chance for an open joint caused by shrinkage of the wood. Where two pieces of baseboard have to be joined on a long stretch of wall, a mitered "lap joint" (also known as a scarf joint) should be positioned and nailed over a stud. The lap joint presents a more pleasing appearance than does a simple butt joint. The faces of the base can be kept flush by mitering (Fig. 6-5).

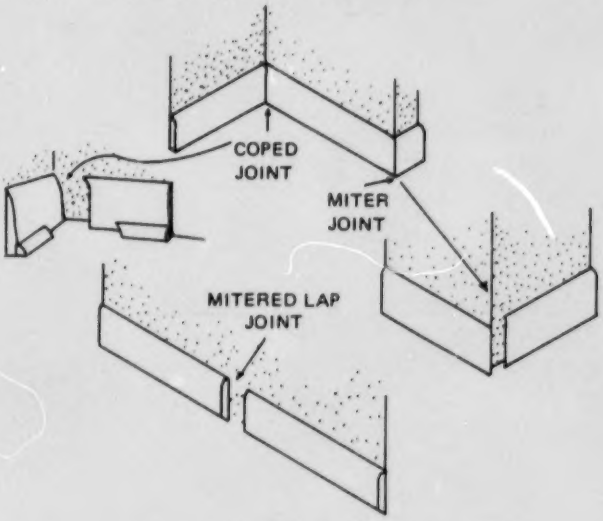



Fig. 6-5. Typical baseboard joints

The coped joint can be made by scribing one piece of baseboard against the other and cutting along this line with a coping saw square to the face. A better method is to cut an inside miter. Then a coping saw is used to cut along the line where the sawed-off surface meets the face of the molding. The coping saw should be held square to the face of the molding. The carpenter should undercut slightly. This technique is described in the assigned material.

## Applying Ceiling Molding

The ceiling molding can be very simple in design with a perfectly flat surface bearing against the wall as shown in View A of Fig. 6-6. The method used in the application of this type is practically identical to that used for the base.

Crown and cove moldings, however, are more difficult to fit (View B of Fig. 6-6). When a crown

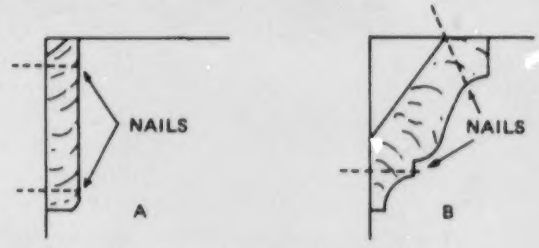



Fig. 6-6. Typical ceiling molding

molding is to be cut, the carpenter must be careful to place the molding in the miter box as it would be placed against the wall and ceiling. The piece must be upside down as shown in Fig. 6-7. Some molding, such as base molding, should be placed in the miter box exactly as it would be when installed.

A mitered lap joint is recommended when two pieces are being spliced (Fig. 6-8).

### Study Assignment

1. Durbahn and Sundberg, *Fundamentals of Carpentry*, Vol. 2 (Fifth edition). Read the sections pertaining to interior trim in Chapter 7.
2. *California Contemporary House Plans*. Study the room finish schedule and the casing and base details shown on Sheet 13.

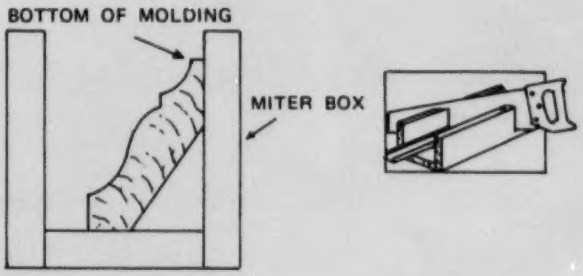



**Fig. 6-7. Correct placement of crown molding in the miter box**

**Fig. 6-8. Mitered lap joint formed in crown molding**

## INTERIOR FINISH

## TOPIC 6 – WOOD MOLDING USED IN INTERIOR TRIM

### Study Guide

Determine the correct words for each numbered blank in the sentence, and write it in the corresponding blank at the right.

1. Casing is primarily used to trim out the openings for 1 and 2 . — 1. _____ 2. _____

2. Other important pieces of trim used to finish off the bottom of the window openings are the 3 and 4 . — 3. _____ 4. _____

3. A piece of molding that covers the space between adjacent windows is called 5 6 . — 5. _____ 6. _____

4. The first trim piece to fit when finishing off the interior of the window would be the 7 . — 7. _____

5. The end of the apron should line up with the 8 of the 9 casings. — 8. _____ 9. _____

6. The most attractive method of finishing off the ends of the stool and apron is to use a 45-degree 10 . — 10. _____

7. A contemporary method of trimming out a window produces a 11 12 effect. — 11. _____ 12. _____

8. The best way to fit base is to 13 the inside corners and miter the 14 joints and outside corner. — 13. _____ 14. _____

9. The 15 16 should be used to cut 45-degree angles on base and ceiling molding. — 15. _____ 16. _____

10. A crown molding should be placed in the miter box as it would be placed against the 17 and 18 . — 17. _____ 18. _____

## INTERIOR FINISH

## TOPIC 7 – PLASTICS AND PLASTIC LAMINATES USED AS WALL COVERINGS

This topic is planned to provide answers to the following questions:

- **What plastics are most commonly used as interior finish material?**
- **How are plastic-laminated panel systems designed and applied to wall surfaces?**
- **How is metal molding used in conjunction with plastic-laminated panel systems?**

Many builders today are using plastics and plastic laminates as finish materials. Of all the new synthetic materials used in place of wood, plastic laminates have the most widespread application. The surface of these materials is hard, attractive, and long-lasting.

The plastic laminates were first introduced as coverings for counters and table tops. They are now used for a wide variety of furnishings, including shelves, doors, benches, store and bank fixtures, and the like. (Fabrication and installation of plastic-laminated countertops will be discussed in Topic 8.)

Plastic laminates are becoming increasingly popular as wall coverings. These materials usually are produced in thin sheets ($\frac{1}{32}$ to $\frac{1}{16}$ inch), and they can be fitted and applied with contact cement directly to a prepared wall surface. As a general rule, however, the plastic laminates are already mounted on $\frac{3}{8}$ or $\frac{1}{2}$-inch panels of plywood or particleboard. These panels range in width from 16 to 48 inches, and the lengths are usually 8 to 10 feet. They are manufactured in a wide variety of imitation wood grains, solid colors, patterns, and three-dimensional textured designs. Numerous panel systems are available. Various methods of fastening are recommended by the manufacturers; however, most of the systems require the use of nails, adhesives, or metal or wood molding. The edges of some panels have grooves for the nails.

### Installation of Plastic-Laminated Panels

The panel systems described in this topic have been designed by the Formica Corporation, one of the pioneers in the field of plastic laminates. The first system, in which adhesive and metal molding are used to fasten the panels into place, is installed as follows:

1. Lay out the wall areas. Lines have to be snapped to locate the metal moldings that will hold the panels (View A in Fig. 7-1).
2. Screw the base molding into the wall. A piece of base material is used as a support during this operation (View B).
3. Place the outside corner molding next. It should not be completely tightened until after the panels are installed (View C).
4. Apply a mastic adhesive to the wall before the panel is installed (View D).
5. Screw a vertical divider into place. When the adhesive has been applied, the next panel can be installed. This process continues until the wall is completed (View E).
6. Apply the cap molding. On long stretches of walls, the cap molding should be placed immediately after installing each series of five panels. This will allow proper alignment of the molding before the mastic adhesive sets up (View F).
7. Snap the decorative laminate inserts into the molding as shown in the details. These inserts cover the screws and help provide a pleasing finish to the wall (View G).

Another example of a panel system is shown in Fig. 7-2. This system requires the use of furring strips, and the panels are joined together with wooden splines. The panels are fastened to the wall by toenailing through the splines into the furring strips. The recommended procedures are as follows:

1. Apply the furring strips horizontally over the studs (or over drywall or plaster) 16 inches on centers (Point A in Fig. 7-2). Determine the layout of the panels. In the illustration the full panels are at the outside corner, and the two inside panels have been cut.
2. Lay out the full-width panels from the outside corner. Plumb and fit the first panel (X) at the inside corner. Rabbet the inside corner to receive the panel on the opposite wall. (This can be done with a portable electric router.) Set a piece of

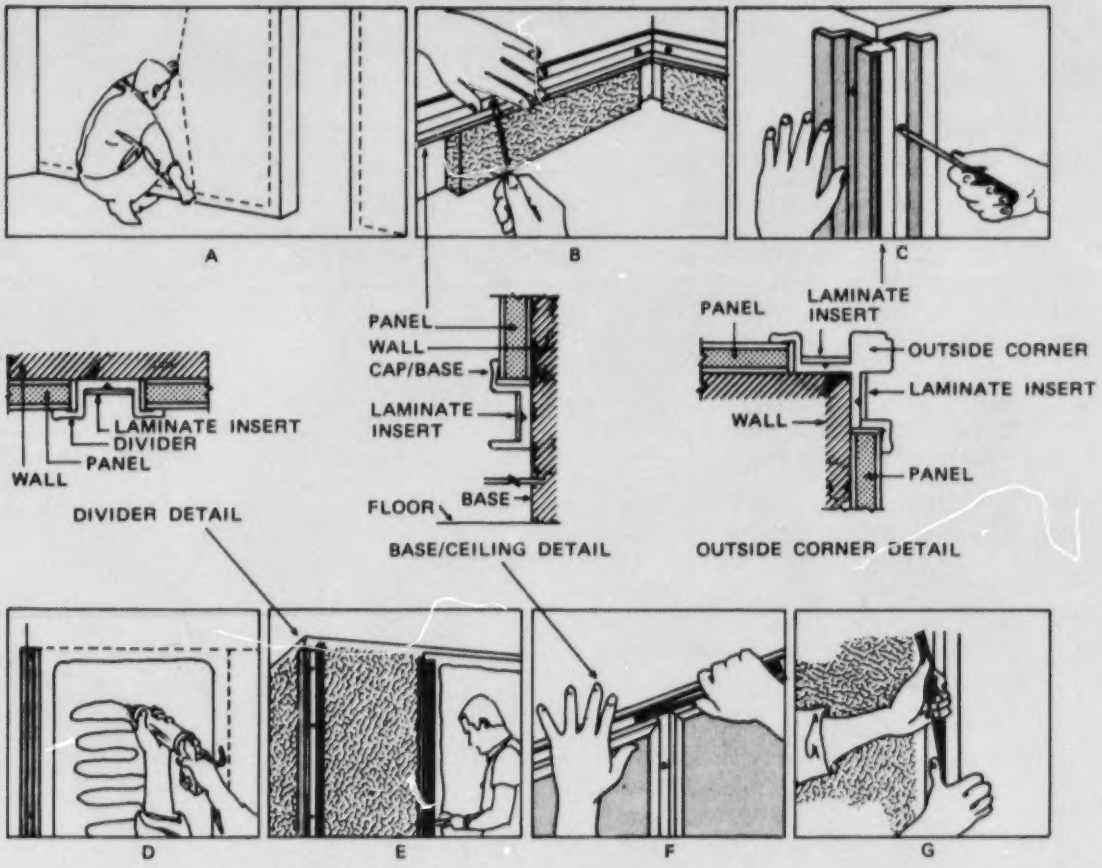



**Fig. 7-1. Panel system applied with adhesive and metal molding**

panel against the opposite wall, and push the first panel (X) up against it. (See Detail B.) Insert a piece of spline into the groove on the right-hand side of the panel (X). (See Detail C.) Toenail the panel into each piece of furring. Remove the panel on the opposite wall, and drive nails through the rabbeted edge into the furring strips as shown in the detail at B. Note the three types of splines shown in the details at C. The V-joint allows the panels to butt directly against each other. The broad-spline joint presents a grooved effect between the panels. The broad-spline-with-insert joint requires a laminate insert. The insert may be of the same finish as that of the panels. The color may be different, but it should be compatible.

3. Install the second panel by sliding it into the spline piece already placed in the first panel (X). Place a spline into the groove on the right-hand side of the second panel, and toenail into the furring strips (Point C). This process is repeated until you reach the end of the wall.
4. Finish outside corners (Point D). One of the details shows a butt joint. In this case a piece of laminate is glued to the edge of one of the panels to cover up the exposed wooden edge. In the second method the edges are routed, and a piece of wooden corner molding is nailed into place.
5. Nail wooden base at the bottom of the wall (Point E). Ceiling molding also can be applied to the top of the wall.

### Vinyl Wall Covering

Vinyl plastic (long established as a resilient floor tile) is now being used as a wall covering. This material is produced in many different patterns and textures, including wood grain finish.

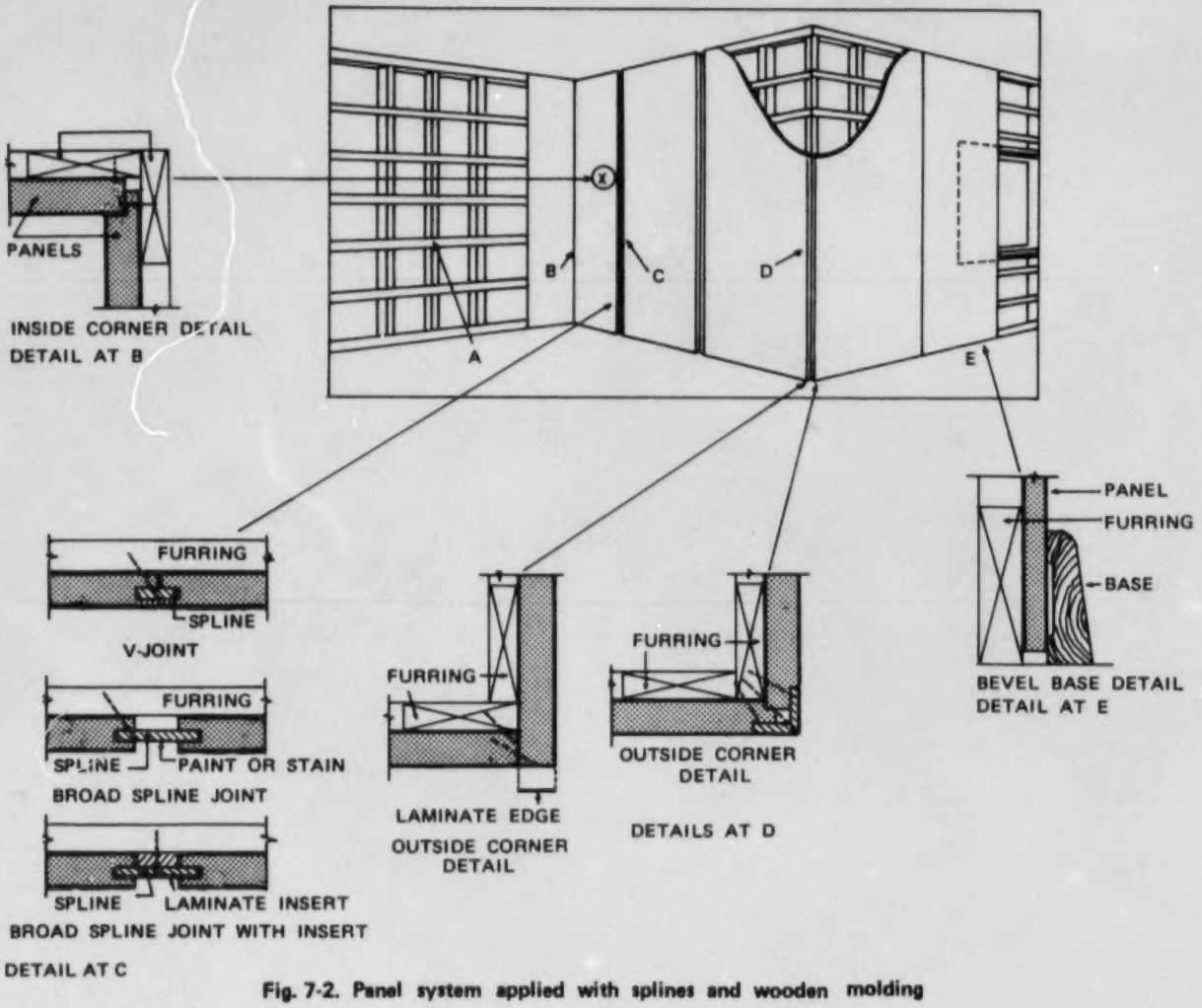



**Fig. 7-2. Panel system applied with splines and wooden molding**

Flexible vinyl sheets can be applied in the same way as wallpaper. Such vinyl sheets can be mounted on hardboard or paperboard and applied to the walls as vinyl-covered panels.

One of the most popular products is vinyl-covered gypsum wallboard. The panels can be fastened to studs or furring strips with nails or staples of matching color. A drywall type of adhesive system also can be used.

### Study Assignment

1. Durbahn and Putnam, *Fundamentals of Carpentry*, Vol. 1. Study the section on plastic laminates in Chapter 6.
2. *Tools, Materials, Ethics, and History of the Trade*, Unit I of *CARPENTRY*. Washington, D.C.: Apprenticeship and Training Department, United Brotherhood of Carpenters and Joiners of America (UBC and JA), 1968. Study informational sheet on laminated plastics. (Optional)

## TOPIC 7 – PLASTICS AND PLASTIC LAMINATES USED AS WALL COVERINGS

### Study Guide

Determine the correct word for each numbered blank in the sentence, and write it in the corresponding blank at the right.

1. Plastic laminates were originally introduced as coverings for 1 and 2 tops. — 1. _____ 2. _____

2. Manufacturers of plastic laminate produce the material in thicknesses of 3 to 4 inch. — 3. _____ 4. _____

3. Plastic-laminated panels are available in widths ranging from 5 to 6 inches. — 5. _____ 6. _____

4. The most common methods of fastening tile panels to the wall employ 7 and metal or wood 8, or nails through 9 that fit into grooves milled into the edges of the panels. — 7. _____ 8. _____ 9. _____

5. Laminate finishes are available in imitation 10 and a variety of 11 and 12. — 10. _____ 11. _____ 12. _____

6. A very popular wall covering is 13 plastic. — 13. _____

7. Flexible vinyl sheets can be applied in the same way as 14. — 14. _____

8. Vinyl mounted on gypsum wallboard can be fastened to the walls with nails or 15. — 15. _____

9. Plastic laminates can be applied to countertops with an adhesive called 16 17. — 16. _____ 17. _____

10. In one panel system the laminated panels are joined together with 18 19. — 18. _____ 19. _____

## TOPIC 8 – INSTALLATION OF BUILT-IN CABINETS AND CLOSETS

This topic is planned to provide answers to the following questions:

- **Where does the carpenter obtain information regarding cabinets?**
- **How are cabinets fastened and installed?**
- **How are plastic-laminated countertops fabricated and installed?**
- **How are built-in closets installed?**

Cabinets generally are made in a cabinet shop or factory and delivered to the job where they are installed by the carpenter. Cabinet installation requires special skills and some knowledge of cabinet construction. The term *built-in* indicates that the cabinet is within the structure and attached to it.

In residential construction most of the cabinet work is in the kitchen and bathroom; however, such items as bookcases, storage units, wardrobes, and desks are also part of the cabinet work. Office buildings, schools, hospitals, banks, and stores require extensive cabinet work.

The specifications contain general information about the cabinets. The floor plans show their location, and the interior elevations indicate the height and position of the cabinets (Fig. 8-1).

The elevation views show the counter height of the cabinets (A) and the distance between the base and the wall units (B). Broken lines show the location of the shelves.

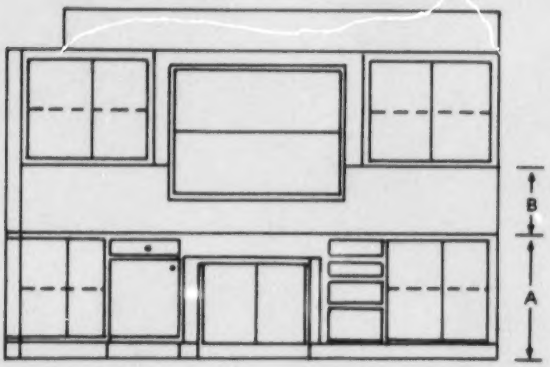



**Fig. 8-1. Elevation views of kitchen cabinets**

### Installation of Cabinets

Cabinets should be set plumb and level when they are installed. In the best construction they are fastened to the wall studs with screws (not nails). Good cabinet construction includes a 1-inch board at the top and bottom of the cabinet to reinforce the back where the screws are to be placed.

Some carpenters will place the base cabinet units before the wall units are installed; however, the work is easier if the wall cabinets are put up first. The carpenter thus can work close to and directly below the cabinets. The example covered in this topic will follow this procedure.

The recommended method of laying out the cabinets shown in Fig. 8-1 is as follows:

1. Find and mark the locations of the studs (Point A in Fig. 8-2).

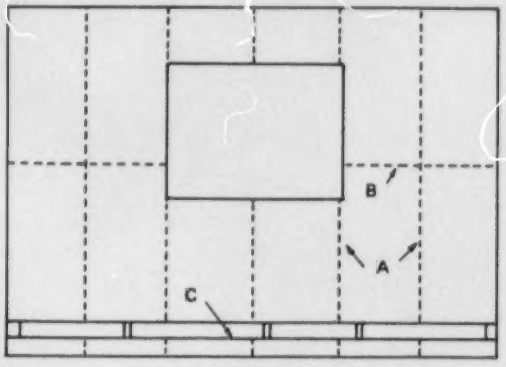



**Fig. 8-2. Layout for the cabinets**

2. Lay out the level lines for the bottom of the wall cabinets (Point B in Fig. 8-2).
3. Cut a rod the exact length equal to the distance between the two walls where the cabinets are to be placed (Point C in Fig. 8-2). Lay out the width of each cabinet on this rod in order to check whether the units will fit into the space. The face frame often extends past the sides of the two end cabinets where they meet the walls. The carpenter should use the rod to determine how much material was allowed for scribing and fitting against the wall.

The wall cabinets should be installed as follows:

1. Nail a cleat at the level line to temporarily support the upper cabinets (Point A in Fig. 8-3).
2. Prepare two braces (stiff legs) to support the front of the cabinet. Set the cabinet in place and plumb it (Point B in Fig. 8-3).
3. Scribe the face frame to the side wall and trim to the line. Another method is to use a thin scribe strip that is nailed on top of the face frame. This eliminates the need for careful scribing of the face frame itself (Point C in Fig. 8-3).
4. Screw the first cabinet into place. Shim shingles can be used if the back wall is not straight and plumb (Point D in Fig. 8-3).
5. Set the second cabinet in place. Secure the two units together with a C-clamp, and screw the two vertical parts of the face frame (stiles) together. Screw the second cabinet to the studs in the wall (Point E in Fig. 8-3).

After the wall cabinets are in place, the carpenter should clear the floor of any materials or tools in preparation for setting the base cabinets in place. The recommended method of installing the base cabinets is as follows:

1. Using shingles, plumb and level the first base cabinet (Point A in Fig. 8-4).
2. Scribe it to the side wall (Point B in Fig. 8-4).
3. Scribe and fit the base section to the floor if a gap appears at the bottom of the toe space after the cabinet has been leveled (Point C in Fig. 8-4).
4. Screw the first cabinet into place (Point D in Fig. 8-4).
5. Place the second cabinet. Clamp and screw the stiles together. Be sure that the tops are even (Point E in Fig. 8-4).
6. Install the third cabinet, using the procedures described in Step 5 (Point F in Fig. 8-4).

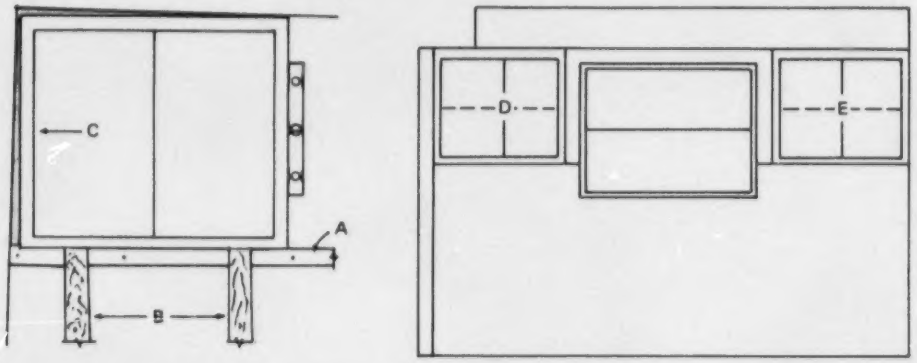



Fig. 8-3. Placing the wall cabinets

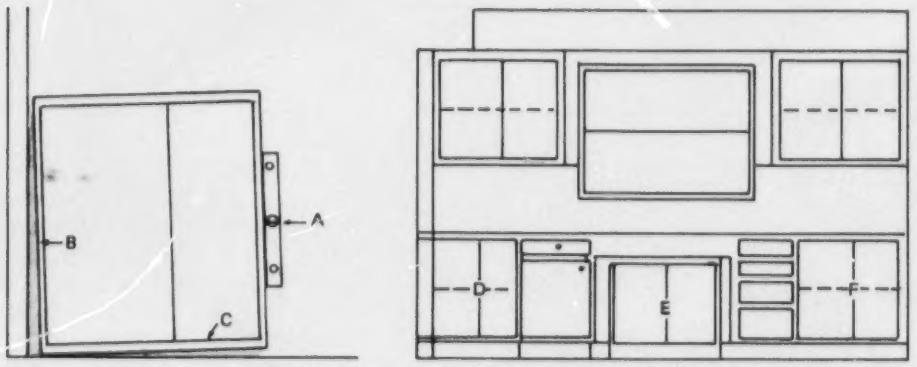



Fig. 8-4. Placing the base cabinets

### Hanging the Cabinet Doors

The cabinet doors can be set in place at the cabinet shop; however, the cabinets may get racked out of square during transportation and installation. This could force the prehung doors out of alignment. Therefore, a frequent practice is to fit the doors after the cabinet has been fastened into place.

The three most common types of doors used on cabinets are flush, lipped, and sliding.

The flush door is the most difficult to hang; it has to be fitted into the opening with $\frac{1}{16}$-inch clearance on all four edges. It can be hung with a loose-pin hinge, a semiconcealed offset hinge, or a surface-mounted hinge (Fig. 8-5).

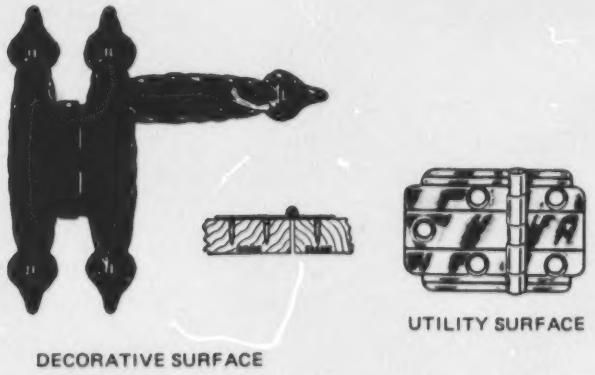



**Fig. 8-5. Hinges used for flush doors**

The lipped door can be installed with less effort than that required for a flush door. A certain amount of adjustment is allowed by the lip feature. A semiconcealed offset hinge is normally used, although a concealed hinge is available (Fig. 8-6).

Sliding doors fit into wooden, plastic, or metal tracks. These doors can be wood, plastic, or glass. Sufficient space should be provided in the upper track to allow for easy installation and removal of the door (Fig. 8-7).

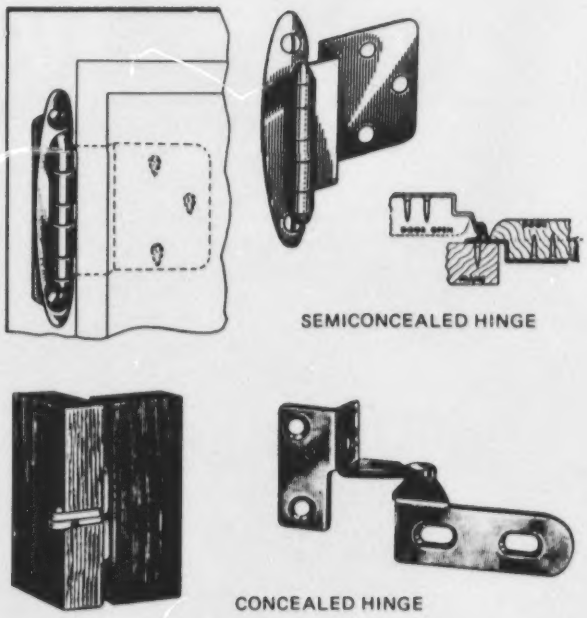



**Fig. 8-6. Hinges used for lipped doors**

### Plastic-Laminated Countertops

Plastic laminate is widely used for surfacing countertops. This material forms a durable, hard surface that is not damaged easily or stained by ordinary household chemicals. Also, it is highly resistant to heat.

The countertop and backsplash generally are prefabricated in the shop. Normally, the laminate is $\frac{1}{16}$ inch thick. If it is properly supported, the material can be cut with a table saw, electric saw, or saber saw that has a fine-tooth blade. A finish handsaw or hacksaw also can be used. A special

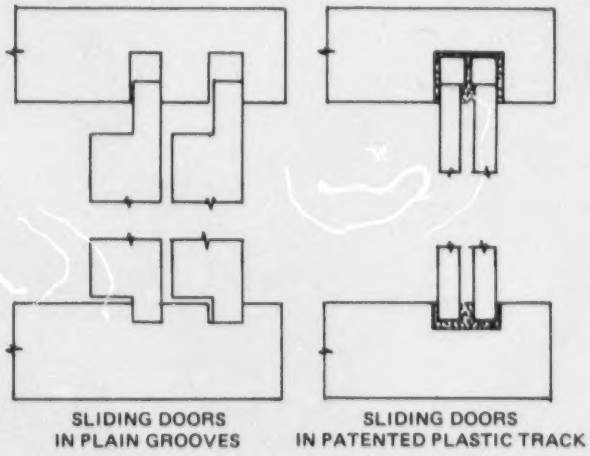



**Fig. 8-7. Sliding cabinet doors and tracks**

laminate sheer is available for cutting irregular shapes. Electric routers with special cutters for trimming are also available.

After being cut, the laminate is bonded with contact cement to a base material of ¾-inch-thick plywood or particleboard. The usual procedure is to cut the laminate oversize so that it will extend ⅛ inch beyond the edges. The material can then be neatly trimmed with an electric router. If power tools are not available, a block plane can be used to dress down the laminate; then a smooth file is used to add the finishing touches.

### Installation of Countertop

After the base cabinets have been secured, the countertop can be installed.

The countertop is fastened with screws as shown in Fig. 8-8. The screws must not be too long. If they come through the top, the counter will be permanently damaged. Also note that all edges of the countertop laminate should be beveled.

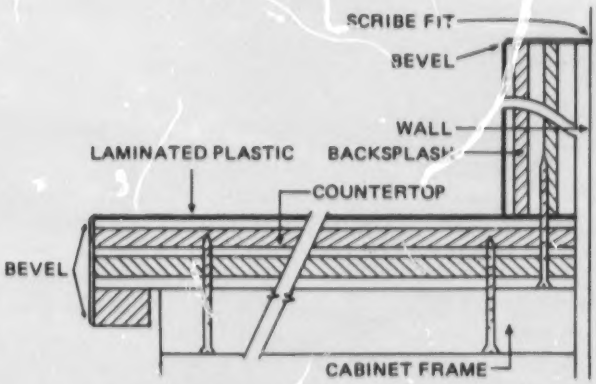



**Fig. 8-8. Plastic-laminated countertop and backsplash**

The backsplash should be secured to the countertop as shown in Fig. 8-8. The backsplash can be fastened at the time the countertop is made in the shop. However, it may have to be attached by the carpenter on the job. The reason for this is that the space into which the counter is to be placed is often out of square and adjustments will have to be made (Fig. 8-9). The backsplash should be installed as follows:

1. Set the counter temporarily in place (Point A in Fig. 8-9).
2. Cut the back and side pieces of the backsplash to their proper lengths. Fasten the ends together with screws (after putting caulking compound in the joint), and place them in position (Point B in Fig. 8-9).

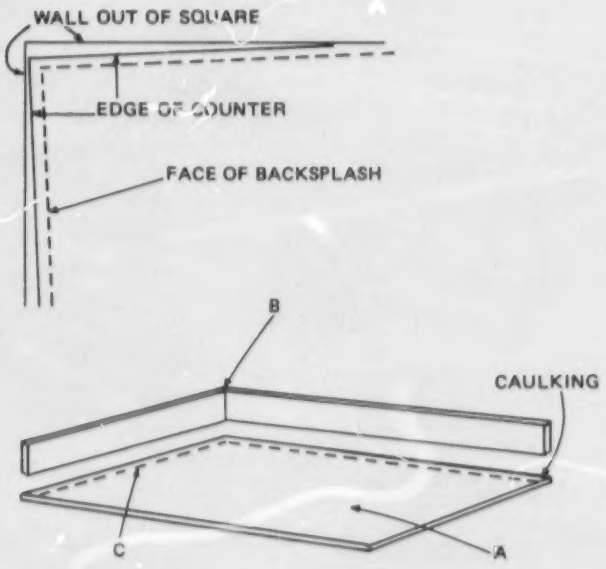



**Fig. 8-9. Fitting and securing the backsplash to the countertop**

3. Mark the location of the backsplash on the countertop (Point C in Fig. 8-9).
4. Remove the countertop from the cabinets.
5. Run a bead of caulking along the edge of the top to seal the joint.
6. Clamp the backsplash to the line marked on the countertop, and secure it in place with screws.

Because the walls behind the backsplash may also be out of alignment, the narrow band of laminate on the top of the backsplash is often omitted. After the countertop unit is in place, the carpenter can cut this edge piece to fit. The recommended procedure is as follows:

1. Cut a piece of laminate ⅛ to ¼ inch greater than the widest point between the backsplash and the wall. Place it in position, and mark it with a pair of scribers. Using a sharp block plane, fit the piece to the wall (View A in Fig. 8-10).
2. Spread contact cement on the wood surface at the top of the backsplash and on the piece of laminate. Allow the cement to set until it is dry to the touch. Be sure the strip is in its proper position when contact is made between the laminate and the backsplash. Using a block of wood and hammer, tap along the entire surface of the laminate to ensure good contact (View B in Fig. 8-10).

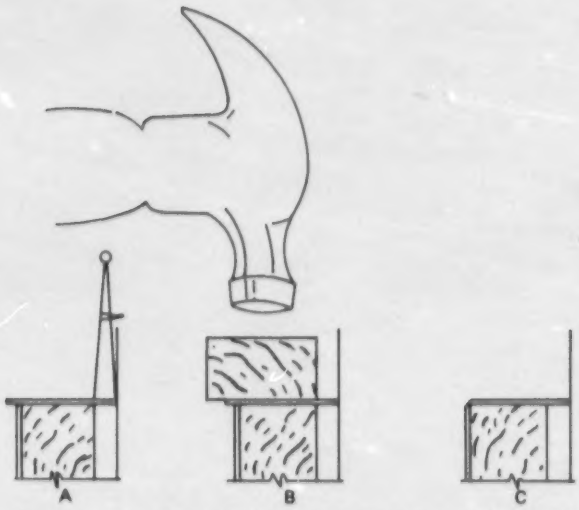



Fig. 8-10. Fitting and applying laminate on top of backsplash

3. Dress down the edge of the laminate that projects from the face of the backsplash. Use an electric router with trimmer attachment. A block plane and smooth mill file can also be used to do the job if a router is not available (View C in Fig. 8-10).

### Built-In Closets and Other Units

Prefabricated built-in closets are sometimes fastened into place by the carpenter on the job. Such closets often serve as attractive room dividers as shown in the assigned material.

Other examples of built-in units that can serve as room dividers are bookcases and desks. A long base cabinet is often used to divide the work area of a kitchen from the dining area.

Where a tall built-in unit (such as a closet) is not attached to the wall, provisions have to be made to give it stability. One method of doing this is as follows:

1. Set the cabinet in place, and mark the outside of the toeboard all the way around (Point A in Fig. 8-11).
2. Remove the cabinet, measure in the thickness of the base material, and mark a line (Point B in Fig. 8-11).
3. Nail pieces of 2 x 4 to the floor flatwise (Point C in Fig. 8-11).
4. Slip the cabinet over the pieces of 2 x 4. Level and scribe if necessary, and then screw or nail the toeboard into the nailer blocks (Point D in Fig. 8-11).

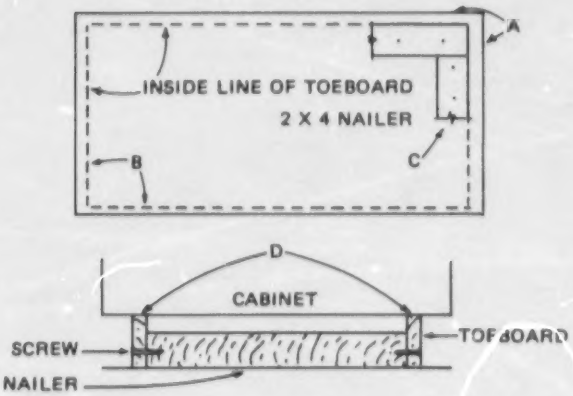



Fig. 8-11. Securing base of a free-standing cabinet to nailing blocks

### Study Assignment

1. Durbahn and Sundberg, *Fundamentals of Carpentry*, Vol. 2 (Fifth edition). Read the material on cabinets in Chapter 7.
2. *California Contemporary House Plans.* Study floor plans and interior elevations, sheets 3 and 4.
3. *Interior Finish,* Unit VI of *CARPENTRY.* Washington, D.C.: United Brotherhood of Carpenters and Joiners of America (UBC and JA), 1950. Read all the units pertaining to cabinets and cabinet installation. (Optional)

## INTERIOR FINISH

## TOPIC 8 – INSTALLATION OF BUILT-IN CABINETS AND CLOSETS

### Study Guide

Determine the correct word for each numbered blank in the sentence, and write it in the corresponding blank at the right.

1. Built-in cabinets are 1 the structure and 2 to it. — 1. _____ 2. _____

2. The sections of the blueprints that give the most information about the cabinets are the 3 4 and interior 5 . — 3. _____ 4. _____ 5. _____

3. Cabinets should be set 6 and 7 and should be 8 into the wall. — 6. _____ 7. _____ 8. _____

4. Before the cabinets are installed, the carpenter should mark the location of the 9 and mark level lines for the 10 of the wall cabinets. — 9. _____ 10. _____

5. The 11 cabinets should be installed before the 12 cabinets are set up. — 11. _____ 12. _____

6. The three types of doors most commonly used with cabinets are 13 , 14 , and 15 . — 13. _____ 14. _____ 15. _____

7. Plastic-laminated countertops generally are 16 in the shop and consist of a 17 and 18 . — 16. _____ 17. _____ 18. _____

8. Built-in closets can serve as very attractive room 19 as well as act as a 20 between two rooms. — 19. _____ 20. _____

9. Cabinets that are not fastened to a wall can be held in place by the use of nailing blocks inside the 21 . — 21. _____

10. Contact cement should be allowed to set until it is 22 to the touch. — 22. _____

## TOPIC 9 – HARDWARE USED IN INTERIOR FINISH

This topic is planned to provide answers to the following questions:

- **What are the different kinds of locks and hinges used on doors?**
- **What are door closers and exit devices?**
- **What hardware items are installed on doors?**
- **What hardware items are used with cabinets?**

The basic items of finish hardware will be described in this topic. Finish hardware is usually the last item installed by the carpenter on the job, and great care has to be taken not to mar the finished, painted, or stained surface. Where boring and mortising are required, the hardware should be fitted and then removed before the painting begins; after the paint is dry, the hardware can be reinstalled.

### Door Hardware

Finish hardware for doors includes many types and styles of hinges, locks, door closers, panic bars, door stops, and the like.

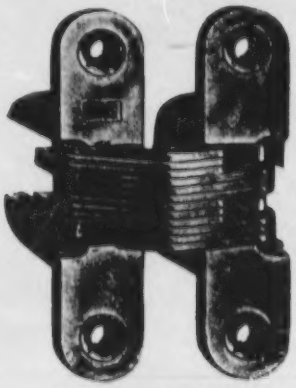
#### Hinges

A door hinge is a flexible device on which a door turns. Hinges are made in different shapes and styles, ranging from plain to ornamental. They have different finishes such as copper and bronze, or they may be primed for painting (Fig. 9-1).

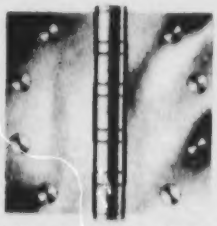
*Loose-pin butt hinge.* The most frequently used door hinge is the loose-pin butt hinge. Large sizes are available for heavy doors. This type of hinge can be obtained with a nonremovable pin.

*Ball bearing hinge.* The ball bearing hinge is recommended for very heavy doors that are installed in public buildings where they are subjected

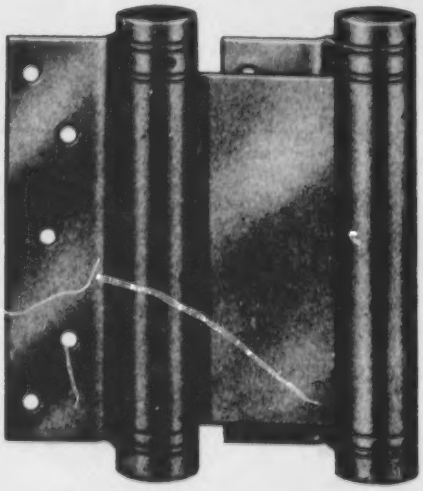
SPRING FLOOR HINGE



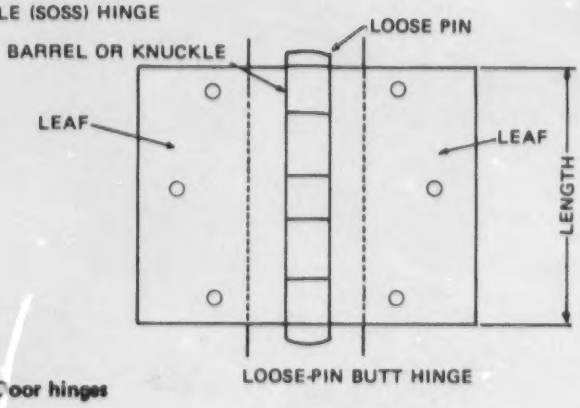
INVISIBLE (SOSS) HINGE



BALL BEARING HINGE



DOUBLE-ACTION SPRING HINGE




LOOSE-PIN BUTT HINGE

Fig. 9-1. Door hinges

to heavy use. This hinge has a washer-type bearing in the barrel of the hinge.

*Spring floor hinge.* The spring floor hinge is a double-action hinge that allows a door to swing in either direction. The body of the hinge is notched into the bottom of the door. In another type the mechanical unit is contained in a pocket in the floor.

*Double-action spring hinge.* The double-action spring hinge is used for doors that can be pushed open from either direction. It has an adjustable spring action that will cause the door to return to a closed position.

*Invisible (Soss) hinge.* The invisible (Soss) hinge is not visible when the door is closed. This hinge is mortised completely into the door and jamb.

### Lock Sets

The cylindrical lock is probably the most frequently used lock. The installation of this lock has been discussed in Topic 5. This lock and others such as mortise locks and dead locks are in demand today because of the public's increased security consciousness. Most locks are available in a great variety of surface finishes and designs. Templates and detailed installation instructions are included in the package with each lock set (Fig. 9-2).

*Cylindrical lock.* The cylindrical lock is a heavy-duty lock. A latch retractor housed in the cylinder engages the latch unit and pulls the latch bolt lock, allowing the door to open.

*Tubular lock.* Tubular locks are used mainly for interior doors.

*Mortise lock.* The mortise lock provides more security than that achieved with any other type of lock. It has a latch bolt and a dead bolt. The dead bolt is operated by a key from the outside and by a knob on the inside of the door. The mortise lock derives its name from the fact that it fits into a mortised edge of the door.

*Dead lock.* Dead locks are frequently added to provide greater security to doors that already have cylindrical locks. They are also used to lock closets and storage areas. The bolt may be operated by a key from both sides of the door; however, some of the locks have a knob on the inside of the door.

*Grip-handle entrance lock.* The grip-handle entrance lock combines the use of the button in the knob inside with the traditional grip handle on the outside.

### Hydraulic Door Closers

Hydraulic door closers are normally used on doors in commercial and public buildings. After

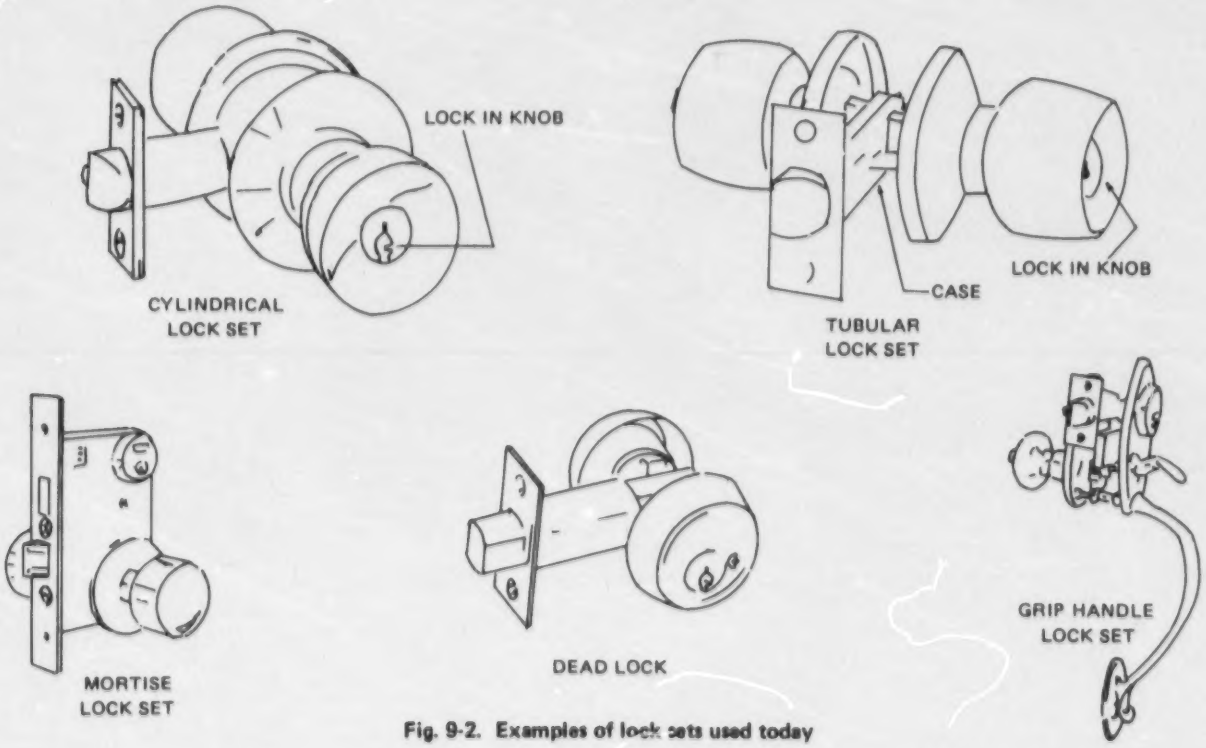



**Fig. 9-2. Examples of lock sets used today**

the door has been opened, it returns to a closed position. The closer can be adjusted for the sweep speed (closing speed) and the latch speed. When the closer is properly adjusted, the door will close at a safe speed, pause near the door jamb, then speed up enough to permit the latch bolt of the lock to retract and to enter the strike on the jamb without slamming the door.

The closer package will include complete instructions for assembling and adjusting the closer. The kit will contain a template for laying out the pilot holes for the screws that will fasten the closer to the door and the shoe to the casing. Also included will be a special wrench for turning the ratchet and a key for adjusting the regulating screw. The closer shown in Fig. 9-3 can be mounted on right- or left-hand doors.

The connecting rod fits into a tubular slide, which is part of the fore arm. A helical spring inside the closer moves the door, and fluid controls the speed. The ratchet can be turned and fixed in place to increase or decrease the spring power. The door and latch speed can be adjusted with the regulating screw. The closer may have a reversible spring so that it is interchangeable for either a left- or right-hand door. This is not true for all closers. Therefore, when a closer is ordered, one should specify the hand of the door.

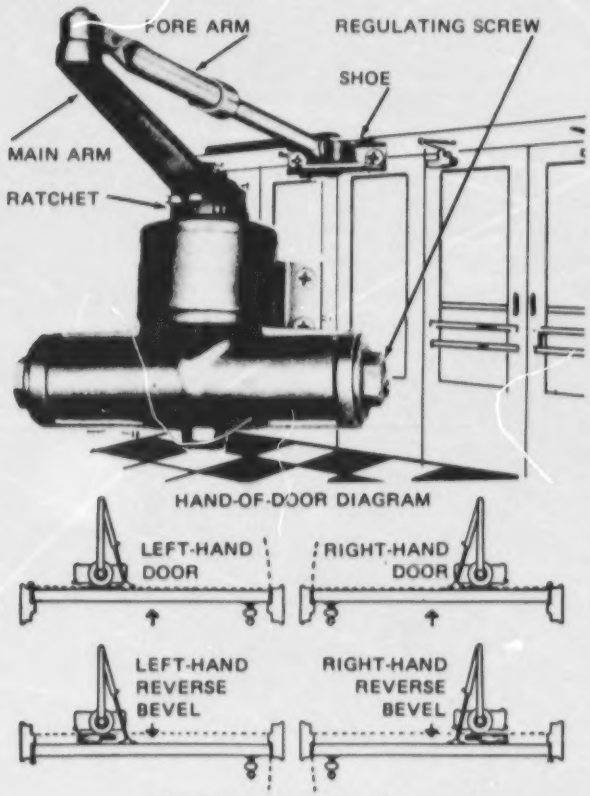



Fig. 9-3. Typical door closer

Some closers are designed so that they can be placed on the inside of the door in what is known as a parallel arm installation. Under some conditions a closer can be mounted on the casing with the shoe attached to the door. Some narrow rectangular closers can be mortised into the top of the door; these are not visible after installation.

#### Exit Devices (Panic Bars)

Exit devices normally are found on the insides of exit doors in public buildings. Safety regulations require that these doors swing out.

Pressure against the cross bar immediately disengages the lock and opens the door. These devices, frequently called "panic bars," prevent the door from becoming jammed or inoperable in an emergency. Horizontal and vertical devices are shown in Fig. 9-4. The manufacturer's installation instructions should be followed carefully.

In the single-door device, the cross bar operates the latch, which engages the adjustable strike. In the double-door vertical rod device, the cross bar operates the vertical bars. The vertical bars retract from strikes located in the head jamb and on the threshold.

#### Miscellaneous Door Hardware

Miscellaneous hardware items related to the door are shown in Fig. 9-5.

*Flush bolt.* Two flush bolts are used on one of the doors of a set of double doors. They are placed at the top and bottom of the inactive door. The handle mechanism is mortised into the edge of the door, and a hole must be drilled accurately to accommodate the bolt.

*Foot bolt.* Foot bolts are usually installed at the bottom of garage doors.

*Chain bolt.* Chain bolts are frequently used in conjunction with foot bolts. They are installed at the top of the door.

*Chain door fastener.* The chain door fastener is a security device. A door that has such a device can be opened slightly and still prevent forcible entry.

*Door holder.* A door holder, which is used to hold doors open, is often used on doors that have door closers.

*Door stop.* The door stop is a device that prevents the door knob from hitting the wall.

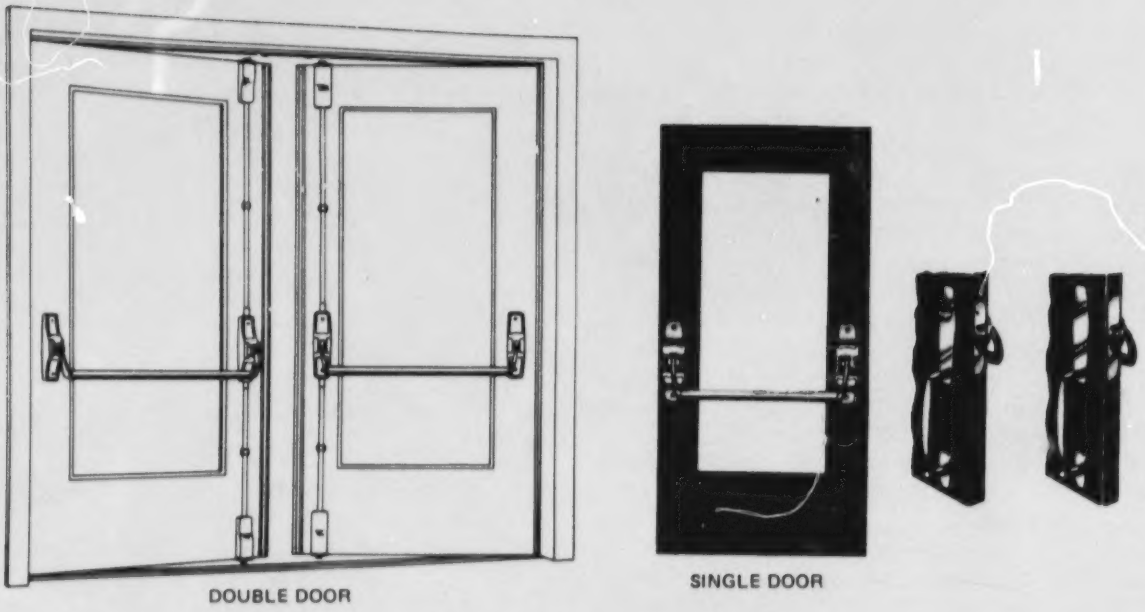



Fig. 9-4. Typical exit devices

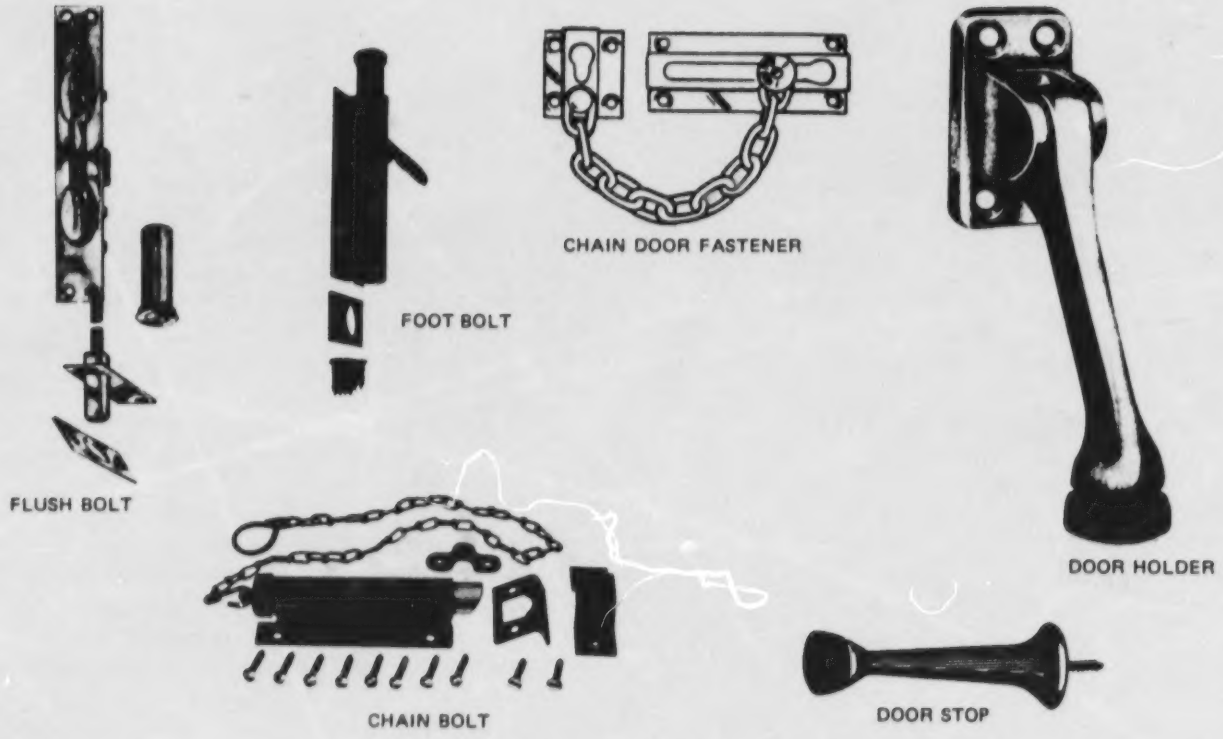



Fig. 9-5. Miscellaneous door hardware

### Cabinet Door Hardware

Cabinet door hardware includes a variety of handles, knobs, and catches (Figs. 9-6 and 9-7).

Holes must be drilled for the bolts that hold the hardware. To prevent splitting out the back of the wood, the carpenter should clamp a piece of wood behind the area where the holes are being drilled.

The doors can be held in the closed position by any one of the many catches available. The rubber roller, friction, and bullet catches rely on friction for the holding action. The magnetic catch is probably the most popular of those shown in Fig. 9-7. These catches are not needed if spring-loaded cabinet door hinges are used.

### Study Assignment

Durbahn and Putnam, *Fundamentals of Carpentry*, Vol. 1 (Fifth edition). Read the chapter on finish hardware.

Fig. 9-6. Cabinet drawer and door hardware

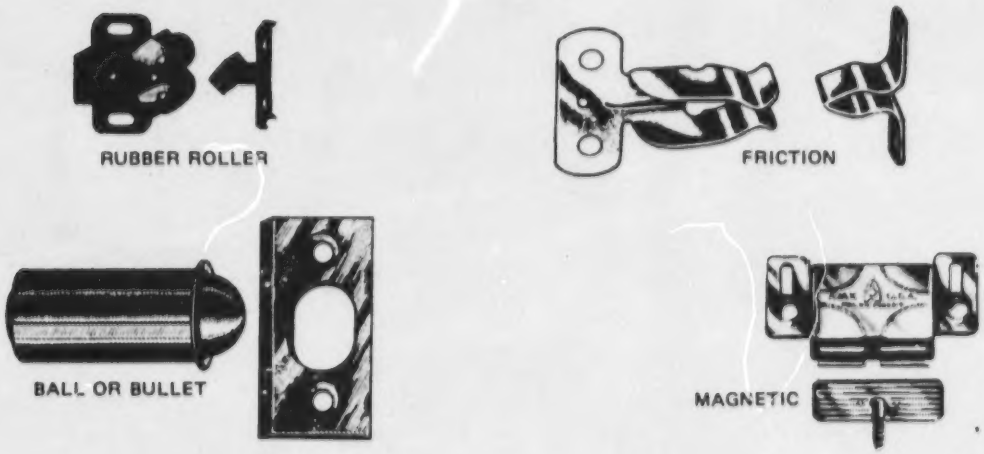


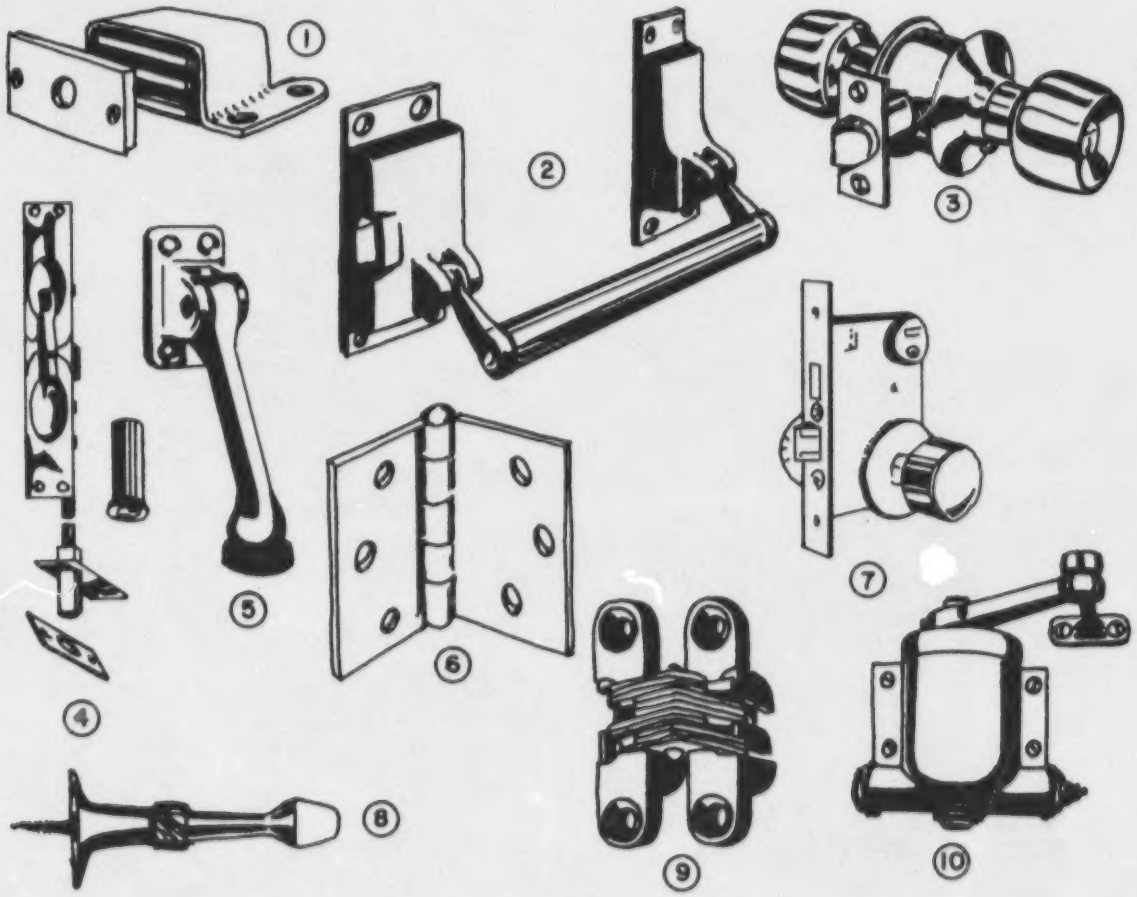

Fig. 9-7. Catches used on cabinet doors

## INTERIOR FINISH

## TOPIC 9 – HARDWARE USED IN INTERIOR FINISH

### Study Guide

Identify each of the following items of finish hardware by writing its name in the numbered space provided below:




1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Determine the correct word for each numbered blank in the sentence, and write it in the corresponding blank at the right.

11. The 11 hinge, which has a 12 pin, is the hinge most frequently used to hang doors. 11. _____ 12. _____

12. In a hydraulic door closer, the main arm engages the 13 on top of the closer. 13. _____

13. Panic bars are designed for 14 or 15 doors. 14. _____ 15. _____

14. The inactive door of a pair of double doors is held in place by 16 bolts. 16. _____

15. A type of cabinet door catch that does not operate on a friction basis is the 17 catch. 17. _____

# Instructional Materials

### Materials Required for Each Apprentice*

*California Contemporary House Plans.* Sacramento: California State Department of Education, 1975. (Orders to: California State Department of Education, Publications Sales, P.O. Box 271, Sacramento, CA 95802. Write for price list and ordering information.)

Durbahn, Walter E., and Robert E. Putnam. *Fundamentals of Carpentry,* Vol. 1, *Tools, Materials, and Practices* (Fifth edition). Chicago: American Technical Society, 1977. (Orders to: American Technical Society, 5608 Stony Island Ave., Chicago, IL 60637.)

Durbahn, Walter E., and Elmer W. Sundberg. *Fundamentals of Carpentry,* Vol. 2, *Practical Construction* (Fifth edition). Chicago: American Technical Society, 1977. (Orders to: American Technical Society, 5608 Stony Island Ave., Chicago, IL 60637.)

*Dwelling Construction Under the Uniform Building Code* (Latest edition). Whittier, Calif.: International Conference of Building Officials. (Orders to: International Conference of Building Officials, 5360 S. Workman Mill Rd., Whittier, CA 90601.)

### Materials Recommended for Further Reference

*CAL/OSHA, State of California Construction Safety Orders* (Latest edition). Los Angeles: Building News, Inc. (Orders to: Building News, Inc., 3055 Overland Ave., Los Angeles, CA 90034.)

Feirer, John, and Gilbert Hutchings. *Carpentry and Building Construction.* Peoria, Ill.: Charles A. Bennett Company, Inc., 1976. (Orders to: Charles Scribner's Sons, Shipping and Service Center, Vreeland Ave., Totowa, NJ 07512.)

*Interior Finish,* Unit VI of *CARPENTRY.* Washington, D.C.: Apprenticeship and Training Department, United Brotherhood of Carpenters and Joiners of America, 1950. (Orders to: Educational Department, United Brotherhood of Carpenters and Joiners of America, 101 Constitution Ave., N.W., Washington, DC 20001.)

Sundberg, Elmer W. *Building Trades Blueprint Reading,* Part 1—*Fundamentals* (Fifth edition). Chicago: American Technical Society, 1972. (Orders to: American Technical Society, 5608 Stony Island Ave., Chicago, IL 60637.)

Sundberg, Elmer W. *Building Trades Blueprint Reading,* Part 2—*Residential and Light Commercial Construction* (Second edition). Chicago: American Technical Society, 1974. (Orders to: American Technical Society, 5608 Stony Island Ave., Chicago, IL 60637.)

*Tools, Materials, Ethics, and History of the Trade,* Unit I of *CARPENTRY.* Washington, D.C.: Apprenticeship and Training Department, United Brotherhood of Carpenters and Joiners of America. (Orders to: Educational Department, United Brotherhood of Carpenters and Joiners of America, 101 Constitution Ave., N.W., Washington, D.C. 20001.)

*Uniform Building Code* (Latest edition). Whittier, Calif.: International Conference of Building Officials, 5360 S. Workman Mill Rd., Whittier, CA 90601.)

Wagner, Willis H. *Modern Carpentry.* South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1979. (Orders to: The Goodheart-Willcox Company, Inc., 123 W. Taft Dr., South Holland, IL 60473.)

*Use latest edition available.

# Course in Carpentry

# INTERIOR FINISH

## Tests

The following section contains objective tests for each topic of the workbook. The value of the tests depends to a great extent on the care taken by instructors and school supervisors in keeping them confidential.

Supervisors and instructors should feel free to modify the application of the workbook material and the tests to satisfy local needs. Also, the instructors will probably supplement the information in the workbook with other material that they themselves have developed, and they will need to augment the tests with questions based upon any supplementary material they may use.

Instructors and supervisors should be aware that the test pages are perforated to facilitate removal of the tests, either individually or as a complete set, at the discretion of the instructor or supervisor.

# Interior Finish Tests

## TOPIC 1 – DESIGN, BLUEPRINTS, AND SPECIFICATIONS

Decide which of the four answers is correct, or most nearly correct; then write the corresponding number in the blank at the right.

1. Which of the following would come under the category of interior finish? 1. _____

   1. Doors and hardware installation
   2. Kitchen cabinets
   3. Base and casings
   4. All of the above

2. The types of interior trim used in a building should be in keeping with the: 2. _____

   1. Kind of furniture to be used
   2. Total design of the structure
   3. Colors the walls are to be painted
   4. Landscaping around the house

3. The trim used in modern buildings is usually: 3. _____

   1. Light
   2. Heavy
   3. Ornate
   4. Simple in design

4. The type of base molding used in a room would most likely be described in the: 4. _____

   1. Floor plans
   2. Finish schedule
   3. Finish schedule and specifications
   4. Specifications

5. Where would the carpenter look to learn the dimensions of all the doors? 5. _____

   1. Door schedule
   2. Floor plan
   3. Elevation views
   4. Specifications

6. Drawings which would give a clearer picture of the trim materials are called: 6. _____

   1. Plan views
   2. Perspective drawings
   3. Blowups
   4. Trim details

7. The abbreviation FSD means: 7. _____

   1. Full section dimensions
   2. Full size details
   3. Full section details
   4. None of the above

8. The carpenter could study the details of a finish door opening in the: 8. _____

   1. Room elevation drawing
   2. Section view drawing
   3. Specifications
   4. Enlarged floor plan drawing

9. The carpenter should study the elevation views of the cabinets to determine the: 9. _____

   1. Materials used to build the cabinets
   2. Type of handles and knobs used
   3. Color of the stain or paint used to finish the cabinets
   4. Location, heights, and dimensions of the cabinets

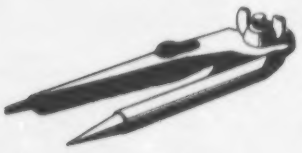
10. Under the heading of "Carpentry and Millwork," the specifications would include information related to: 10. _____

    1. The wood molding only
    2. The kitchen cabinets and casework only
    3. The rough framing only
    4. All aspects of the interior finish of the house

## INTERIOR FINISH TESTS

## TOPIC 2 – TOOLS USED FOR INTERIOR FINISH WORK

Below are the names and illustrations of tools used in interior finish work. Match each illustration with its identifying name by writing the correct letter in the space provided.

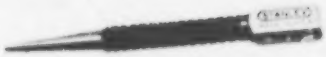


A

B

C

D



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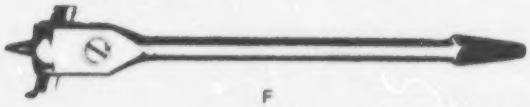

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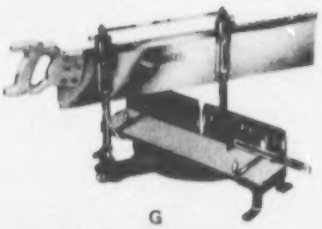

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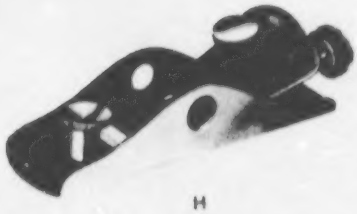

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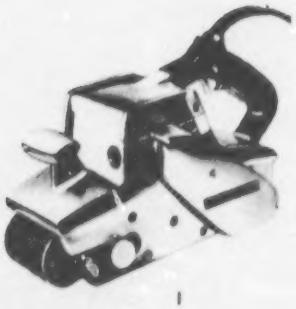

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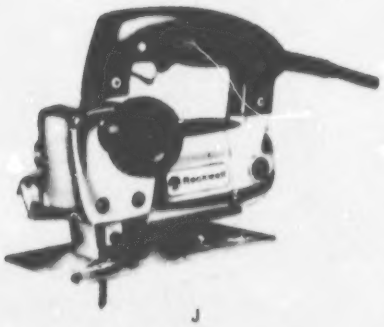

J

1. Block plane _____
2. Belt sander _____
3. Saber saw _____
4. Expansive bit _____
5. Butt gage _____
6. Miter box _____
7. Backsaw _____
8. Spiral ratchet screwdriver _____
9. Nail set _____
10. Scriber _____

Decide which of the four answers is correct, or most nearly correct; then write the corresponding number in the blank at the right.

11. Which saw is used to cut curved or sloping surfaces on molding? 11.____

1. Compass saw
2. Dovetail saw
3. Coping saw
4. Backsaw

12. Which type of bench plane is used to make grooves and dadoes? 12.____

1. Router
2. Rabbet
3. Smooth
4. Bullnose

13. Which hand boring tool is used most frequently by the trim carpenter? 13.____

1. Hand drill
2. Push drill
3. Breast drill
4. Ratchet brace

14. Which statement best describes the expansive bit that is used with the ratchet brace? 14.____

1. It does not have a feed screw.
2. It is designed especially to bore deep holes.
3. It has an adjustable cutter.
4. It is used to countersink the screw heads.

15. For what purpose is the angle divider tool used? 15.____

1. Leveling
2. Laying out door hinges
3. Scribing
4. Marking miter cuts that are not at a 45-degree angle

16. The steel miter box is used for: 16.____

1. Making square and angular cuts
2. Making cuts only at 45- and 90-degree angles
3. Cutting steel
4. Making only 45-degree angle cuts

17. Portable power tools are: 17.____

1. Operated electrically
2. Not moved easily
3. Operated electrically or pneumatically
4. Supplied by the carpenters

18. The power tool used for mortising out door hinges is called a(n): 18.____

1. Bayonet saw
2. Electric router
3. Mortiser
4. Power block plane

19. What is the most frequent use of the power plane? 19. _____

1. Planing the surfaces of molding
2. Fitting doors
3. Jointing the edges of thick boards
4. Fitting cabinet doors

20. The main advantage of the orbital sander is that it: 20. _____

1. Can be used in space-limited areas
2. Is the best sander to use on open flat areas
3. Works well for metals and plastics
4. Is the best tool for smoothing and rounding edges

## INTERIOR FINISH TESTS

## TOPIC 3 – FINISH INTERIOR WALL COVERINGS

Decide which of the four answers is correct, or most nearly correct; then write the corresponding number in the blank at the right.

1. What type wallboard is used as a base for bathroom tile? 1.____

   1. Insulated
   2. Gypsum
   3. Moisture resistant
   4. Aluminum foil laminated

2. Interior plywood wall panels usually come in thicknesses of: 2.____

   1. ⅛ inch
   2. ¼ inch
   3. ½ inch
   4. ¾ inch

3. Attractive shadow lines on panels are formed by: 3.____

   1. Vertical grooves
   2. Special painting techniques
   3. Vertical battens nailed to the panel
   4. None of the above

4. Before panels are applied to masonry walls, the walls should be prepared with: 4.____

   1. A layer of gypsum wallboard
   2. Wood studs
   3. Wood furring strips
   4. An extra coat of plaster

5. A miter joint at the outside corner of a paneled wall is: 5.____

   1. Highly recommended
   2. Not recommended
   3. Better than a solid piece
   4. Superior to corner molding

6. Before the first panel is scribed, the carpenter should: 6.____

   1. Number it.
   2. Mold it to the next panel.
   3. Cut holes for plugs and switches.
   4. Plumb it.

7. What should be used to fasten panels to a wall? 7.____

   1. Nails only
   2. Nails, staples, or adhesives
   3. Nails or adhesives
   4. Nails or staples

8. When panels are being fastened, the nails should be spaced: 8.____

   1. 6 to 8 inches on centers throughout the panel
   2. 12 inches on centers throughout the panel
   3. 6 to 8 inches on centers around the edges and 12 inches on centers in the field
   4. 10 inches on centers throughout the panel

9. When panels are fastened with adhesives, a good bond can be achieved: 9._____

   1. If nails are also used
   2. If the wall is primed and sealed by the painter
   3. Only if furring strips are used
   4. By carefully following the instructions that come with the product

10. If interior solid wood boards are to be applied vertically, the carpenter should use: 10._____

    1. A backing of gypsum wallboard
    2. Horizontal blocking or furring strips
    3. Building paper underneath
    4. Vertical wooden studs or furring strips

## INTERIOR FINISH TESTS

### TOPIC 4 – INSTALLATION OF JAMBS IN INTERIOR DOOR OPENINGS

Decide which of the four answers is correct, or most nearly correct; then write the corresponding number in the blank at the right.

1. What material is normally used for a door jamb? 1.____

   1. Wood
   2. Metal
   3. Wood or metal
   4. Plastic

2. The molding used around the wooden door jamb is called: 2.____

   1. Casing
   2. Base
   3. Cove
   4. Bed

3. The purpose of kerfing the back of the jamb material is to: 3.____

   1. Make the material easier to nail.
   2. Prevent a crack between the casing and the jamb.
   3. Make the material easier to cut.
   4. Minimize the tendency for the jamb to cup.

4. A jamb is being assembled for a door 2 feet 8 inches wide. The dadoes on the side pieces are ¼ inch deep, and an additional ⅛ inch should be allowed for fitting the door. What should be the length of the head piece? 4.____

   1. 2 feet 8 inches
   2. 2 feet 8 ½ inches
   3. 2 feet 8 ⅝ inches
   4. 2 feet 8 ¾ inches

5. The first step in installing a jamb is to: 5.____

   1. Square the head piece to the sides.
   2. Center the jamb in the rough opening by placing shingles at the top on both sides.
   3. Plumb and straighten the hinge side piece.
   4. Place a board cut to the exact width of the jamb between the bottoms of the two side pieces.

6. The carpenter usually plumbs the side piece with a: 6.____

   1. Hand level
   2. Plumb bob
   3. Straightedge and hand level
   4. All of the above

7. The casing is usually set back from the face of the jamb a distance of: 7.____

   1. ¼ inch
   2. ⅜ inch
   3. ½ inch
   4. ⅝ inch

8. The best nailing system for casing is: 8. _____

1. An 8d nail along the jamb edge, a 4d nail into the stud, and nails spaced 16 inches on centers
2. A 4d or 6d nail along the jamb edge, an 8d nail into the stud, and nails spaced 16 inches on centers
3. A 4d or 6d nail along the jamb edge, an 8d nail into the stud, and nails spaced 24 inches on centers
4. Any of the above

9. When they are first applied, door stops should be: 9. _____

1. Set back the exact thickness of door and tacked
2. Nailed fast and set back slightly more than the door thickness
3. Tacked even with the edge of the jamb
4. Set back slightly more than the door thickness and tacked

10. Metal "drywall" frames are usually fastened to the wall with: 10. _____

1. Nails
2. Screws into adjustable clips
3. Bolts into expansion shields
4. Concrete nails

## INTERIOR FINISH TESTS

## TOPIC 5 – FITTING AND HANGING INTERIOR DOORS

Decide which of the four answers is correct, or most nearly correct; then write the corresponding number in the blank at the right.

1. A door consisting of a wood frame covered by face panels is called a: 1._____

   1. Panel door
   2. Solid door
   3. Flush door
   4. Surfaced door

2. What feature would identify a fire door? 2._____

   1. Solid wood core
   2. Aluminum frame
   3. Metal surface on both sides
   4. Fiber core

3. What is the thickness of a typical interior door? 3._____

   1. 1 3/8 inches
   2. 1 1/2 inches
   3. 1 5/8 inches
   4. 1 3/4 inches

4. How much clearance should be provided around a stained door? 4._____

   1. 1/32 inch
   2. 3/32 inch
   3. 1/16 inch
   4. 1/8 inch

5. A door 6 feet 8 inches high is usually found in a: 5._____

   1. Commercial building
   2. Public building
   3. Store entrance
   4. Residence

6. Door hinges are gained out with an electric: 6._____

   1. Router
   2. Plane
   3. Router used with a template kit
   4. Drill and template kit

7. The leaf of a hinge should be: 7._____

   1. Flush with the edge of the door
   2. Projected past the edge of the door one-half the thickness of the casing material
   3. Projected past the edge of the door one-half the width of the leaf itself
   4. Projected 1/8 inch past the edge of the door

8. The backset of a cylindrical lock is the distance from the: 8._____

   1. Face of the latch unit to the center of the cylindrical case
   2. Face of the latch unit to the inside edge of the cylindrical case
   3. End of the latch bolt to the edge of the door
   4. Outside of the knob to the edge of the door

9. What is the hand of the door if you are standing outside of a door, the butts are on your right, and the door opens toward you? 9.____

1. Left-hand door
2. Right-hand reverse bevel door
3. Right-hand door
4. Left-hand reverse bevel door

10. A door that slides into a frame in the wall is known as a: 10.____

1. Bypass door
2. Bifold door
3. Pocket sliding door
4. Framed door

## INTERIOR FINISH TESTS

## TOPIC 6 – WOOD MOLDING USED IN INTERIOR TRIM

Decide which of the four answers is correct, or most nearly correct; then write the corresponding number in the blank at the right.

1. A molding used to trim around door and window openings is called: 1._____

   1. Base
   2. Casing
   3. Quarter round
   4. Cove

2. Where is crown molding used? 2._____

   1. At the bottom of the wall
   2. Around door openings
   3. At the corners of paneled walls
   4. At the ceiling line

3. A flat level trim piece at the bottom of the window and nailed on top of the sill is called the: 3._____

   1. Stool
   2. Mullion
   3. Stop
   4. Apron

4. The apron piece located beneath the window is: 4._____

   1. Part of the casing
   2. The same length as the stool
   3. The same length as the distance between the outside edges of the side casings
   4. Longer than the stool

5. When trim is being applied to a wall, the carpenter should first: 5._____

   1. Nail the base down
   2. Apply ceiling molding
   3. Trim out the door and window openings
   4. None of the above

6. To make a neat finish at the exposed end of a piece of molding, the carpenter should: 6._____

   1. Square it off.
   2. Cut the ends at a 45-degree angle, and form a return.
   3. Square it, and bevel the edges.
   4. Cut the ends at a 45-degree angle.

7. The best way to fit the inside corners of base and ceiling mold is: 7. _____

1. To cope one piece against the other
2. To nail a piece of thin molding over the joint
3. To make an inside miter joint
4. All of the above

8. The outside corners of base and ceiling molding should be: 8. _____

1. Coped
2. Butted
3. Covered with a corner piece
4. Mitered

9. A mitered cut where two pieces of baseboard or ceiling moldings are joined in between the ends of the wall is known as a: 9. _____

1. Coped joint
2. Butt joint
3. Lap joint
4. Molding joint

10. The best way to make a coped inside corner joint is to: 10. _____

1. Use a miter box.
2. Make an inside miter cut, and cut along the line made between the sawed and unsawed surfaces of the molding.
3. Scribe the piece to be cut with a scriber.
4. Use a block plane to fit the pieces.

## INTERIOR FINISH TESTS

## TOPIC 7 – PLASTICS AND PLASTIC LAMINATES USED AS WALL COVERINGS

Decide which of the four answers is correct, or most nearly correct; then write the corresponding number in the blank at the right.

1. A synthetic material that is replacing wood as a wall finish is: 1.____

   1. Wood veneer
   2. Plastic laminate
   3. Polyurethane
   4. Terrazzo

2. Plastic laminates are used as a covering for: 2.____

   1. Walls and countertops
   2. Furniture and shelving
   3. Store and bank fixtures
   4. All of the above

3. How thick are sheets of plastic laminate? 3.____

   1. 1/32 to 1/16 inch
   2. 3/32 to 1/8 inch
   3. 1/8 to 3/16 inch
   4. 1/8 to 1/4 inch

4. The sizes of plastic laminate panels range from: 4.____

   1. 3 to 4 feet wide and 10 to 12 feet long
   2. 1 foot 4 inches to 4 feet wide and 10 to 12 feet long
   3. 1 foot 4 inches to 4 feet wide and 8 to 10 feet long
   4. 4 to 6 feet wide and 8 to 10 feet long

5. Of all the laminated plastic finishes, the one that would not have a smooth surface is: 5.____

   1. Imitation wood grain
   2. Textured design
   3. Solid color
   4. Patterned

6. When panel systems are being installed with adhesives and metal moldings, the first operation after laying out the wall area would be to: 6.____

   1. Install the corner molding.
   2. Apply the adhesive to the wall.
   3. Install the cap molding.
   4. Install the base molding.

7. A wooden strip that fits into a groove on the side of the panel and is toenailed into the wall is called a: 7.____

   1. Spline
   2. Furring strip
   3. Laminate insert
   4. Chamfer strip

8. When a spline is used to join two panels, it is fastened to the wall or furring strip with: 8.____

   1. Adhesives
   2. Nails
   3. Metal molding
   4. Metal molding and adhesives

9. One of the most popular decorative plastic wall coverings is called: 9._____

1. Gypsum
2. Particleboard
3. Vinyl sheet
4. Polystyrene

10. Vinyl-surfaced gypsum panels usually are fastened to the walls with: 10._____

1. Nails or adhesives
2. Metal molding and adhesives
3. Adhesives only
4. Nails only

## INTERIOR FINISH TESTS

## TOPIC 8 – INSTALLATION OF BUILT-IN CABINETS AND CLOSETS

Decide which of the four answers is correct, or most nearly correct; then write the corresponding number in the blank at the right.

1. The term *built-in cabinet* means: 1. _____

   1. The cabinet is built on the job.
   2. The cabinet is part of the structural framework of the building.
   3. The cabinet is within and attached to the structure.
   4. All of the above could be true.

2. The blueprint sections that provide the most information about the cabinets are the: 2. _____

   1. Floor plan and interior elevations
   2. Plot plan and interior elevations
   3. Floor plan and exterior elevations
   4. Specifications and floor plans

3. To do the best job, the carpenter should fasten cabinets to the wall with: 3. _____

   1. Nails or screws
   2. Nails
   3. Toggle bolts
   4. Screws

4. When placing the cabinets, installers find it more convenient to: 4. _____

   1. Install the base cabinets first.
   2. Install the wall cabinets first.
   3. Install a base cabinet and then the wall cabinet above it.
   4. All of the preceding methods are equally good.

5. A good way to hold the wall cabinet temporarily in place while fitting and securing it is to: 5. _____

   1. Nail a temporary cleat at the bottom.
   2. Hold it up with your shoulder.
   3. Tack it in place with nails.
   4. Nail a temporary cleat at the bottom against the wall and place "stiff legs" toward the front.

6. On what type of doors are offset hinges used? 6. _____

   1. Sliding
   2. Flush and lipped
   3. Flush only
   4. Lipped only

7. To bond plastic laminate to a base material, the carpenter should use: 7. _____

   1. White glue
   2. Mastic adhesive
   3. Contact cement
   4. Casein glue

8. The piece along the back and sides of the countertop is called the: 8. _____

1. Backboard
2. Soffit
3. Backsplash
4. Cove

9. Built-in closets sometimes also serve as: 9. _____

1. Room dividers
2. Bookcases
3. Bearing walls
4. Counters

10. A cabinet that is not screwed to the wall can be secured by: 10. _____

1. Toenailing through the toeboard into the floor
2. Gluing the base of the cabinet to the floor
3. Using metal angle brackets
4. Screwing or nailing the toeboard into nailing blocks that have been fastened to the floor

## INTERIOR FINISH TESTS

## TOPIC 9 – HARDWARE USED IN INTERIOR FINISH

Decide which of the four answers is correct, or most nearly correct; then write the corresponding number in the blank at the right.

1. The hinge used most frequently for hanging doors is called a: 1.____

   1. Double action swing hinge
   2. T-hinge
   3. Soss hinge
   4. Butt hinge

2. A spring floor hinge is: 2.____

   1. The same as an invisible hinge
   2. Notched into the bottom of the door
   3. Similar to a ball bearing hinge
   4. Fitted to the edge of the door

3. What is the most frequently installed lock? 3.____

   1. Tubular lock
   2. Mortise lock
   3. Dead bolt
   4. Cylindrical lock

4. A mortise lock has the advantage of: 4.____

   1. Being easier to install
   2. Being economical
   3. Providing greater security
   4. All of the above

5. A device often added to provide greater security for a door that already has a cylindrical lock is a: 5.____

   1. Dead bolt
   2. Tubular lock
   3. Night latch
   4. Slip bolt

6. The purpose of a hydraulic door closer is to: 6.____

   1. Keep the door closed.
   2. Return the door to a closed position.
   3. Control the opening of the door.
   4. Regulate double doors.

7. In placing an order for a hydraulic door closer, one should: 7.____

   1. Specify whether the door is solid or hollow core.
   2. Be concerned about the brand only.
   3. Indicate whether the door is panel or flush.
   4. Specify the hand of the door.

8. An exit door opening device (panic bar) is important for the purpose of: 8. _____

1. Locking exit doors
2. Allowing a safe and rapid exit in case of emergency
3. Acting as a door holder
4. Acting as a door closer

9. A device for securing the inactive door of a set of double doors is called a: 9. _____

1. Flush bolt
2. Door stop
3. Chain door fastener
4. Door holder

10. A vertical rod exit door opening device is used on what type door? 10. _____

1. Single
2. Sliding
3. Double
4. None of the above

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